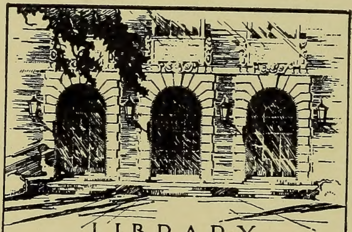

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Agriculture
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CATALOG 1908-1909

Vol. VI BULLETIN No. 5

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PRESIDENT'S OFFICE

IOWA
STATE COLLEGE
OF
AGRICULTURE AND MECHANIC ARTS

CATALOGUE NUMBER
FEBRUARY, 1908
AMES, IOWA

Published Monthly by the Iowa State College of Agriculture and Mechanic Arts. Entered as Second-class Matter October 26, 1905, at the Post Office at Ames, Iowa, under the Act of Congress of July 16, 1904. : : : : :

Separate announcements of the Engineering, Agricultural and Veterinary Divisions as well as the College Catalogue, Compendium and Short Course announcements will be sent gratuitiously to anyone wishing them. In calling for announcements, please state the Division concerning which information is desired. Address all communications to A. B. Storms, President of Iowa State College, Ames, Iowa.

TORCH PRESS
CEDAR RAPIDS
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CALENDAR—1908-1909

1908

JULY

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1909

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1909

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NOVEMBER

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DECEMBER

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CALENDAR FOR 1908-1909

1908.

SECOND SEMESTER.

January 15, Wednesday, 7:45 A. M.	Entrance Examinations.
January 16-18, Thursday to Saturday	Registration-Classification Days.
January 20, Monday, 7:45 A. M.	College Work begins.
February 1, Saturday, 8:00 P. M.	Joint Y. M. C. A. and Y. W. C. A. Reception.
February 22, Saturday, 11:30 A. M.	General Convocation of Students—Washington's Birthday.
March 2, Monday	Selection of Senior Honor Students.
March 21, Saturday, 8:00 P. M.	Freshman-Sophomore Annual.
March 25, Wednesday, 5:00 P. M.	Easter Vacation begins.
March 30, Monday, 7:00 P. M.	Easter Vacation closes.
April 3, Friday	Inter-society **Declamatory Contest.**
May 4, Monday	Recommendation of Candidates for Graduation.
May 13, Wednesday	Last Date for Examination of Candidates for Master's Degree.
May 23, Saturday	Last Date for Presenting Theses to Thesis Committee.
May 29, Friday	State Field Meet.
May 29, Friday, 8:00 P. M.	Graduation Exercises of Literary Societies.
May 29, Friday	Civil and Mining Engineers go into Summer Camp.
May 30, Saturday	Memorial Day—Holiday.
May 30, Saturday, 8:00 P. M.	Semester Musical Recital.
May 31, Sunday, 10:30 A. M.	Baccalaureate Sermon.
May 31, Sunday, 8:00 P. M.	Address before the Christian Associations.
June 1, Monday, 8:00 P. M.	Junior Class Play.
June 2, Tuesday, 2:30 P. M.	Senior Class Day Exercises.
June 2, Tuesday, 8:00 P. M.	Grand Concert.
June 3, Wednesday, 7:30 A. M.	Senior Breakfast.
June 3, Wednesday	Alumni Business Meeting.
June 3, Wednesday, 8:00 P. M.	Senior Promenade.
June 4, Thursday, 10:30 A. M.	Commencement Address and Presentation of Diplomas.
June 4, Thursday, 1:00 P. M.	Alumni and Faculty Banquet.
June 5, Friday	Summer vacation begins.

FIRST SEMESTER.

September 1-2, Tuesday and Wednesday	Entrance Examinations.
September 3, Thursday, 7:45 A. M.	First Semester begins.
September 3-5, Thursday to Saturday	Registration and Classification Day
September 7, Monday, 7:45 A. M.	College Work begins.
September 19, Saturday, 8:00 P. M.	Y. M. C. A. and Y. W. C. A. Rece tion.
October 1, Tuesday	Last Date for Presentation of Su jects for Bachelor's Degree.
October 3, Saturday, 8:00 P. M.	Junior Trot.
October 17, Saturday, 8:00 P. M.	Sophomore-Freshman Annual.
October 21, Wednesday	College Day.
November 26-27-28, Thursday to Saturday	Thanksgiving Vacation.
December 21-22, Tuesday and Wednesday	Semester Examinations.
December 23, Wednesday, 5:00 P. M.	College Work closes.

1909.

January 4-16, Monday to Saturday	Special Short Courses in Agricu ture and Domestic Economy.

1909.

January 19-20, Tuesday and Wednesday	Entrance Examinations.
January 21-23, Thursday to Saturday	Registration and Classification Day
June 10, Thursday	Second Semester closes.

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Hon. Vincent Zmunt	Second District	Iowa City
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Hon. E. J. Orr	Fourth District	Waukon
Hon. W. R. Moninger	Fifth District	Marshalltown
Hon. W. O. McElroy	Sixth District	Newton
Hon. C. R. Brenton	Seventh District	Dallas Center
Hon. G. S. Allyn	Eighth District	Mt. Ayr
Hon. James H. Wilson	Ninth District	Adair
Hon. J. B. Hungerford	Tenth District	Carroll
Hon. W. J. Dixon	Eleventh Dictrict	Sac City

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E. W. Stanton	Ames	Secretary
Herman Knapp	Ames	Treasurer
W. A. Helsell	Odebolt	Financial Secretary
Ben Edwards	Ames	Custodian

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Rules: Trustees Orr, Zmunt and McElroy.

Bonds and Contracts: Trustees Moninger and Wilson.

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Scientific Departments: Trustee Jones, Supt. Riggs, Trustees Allyn, Orr and Brenton.

Literary Departments and Library: Trustees Wilson, Zmunt, Supt. Riggs, Trustees Brenton and Jones.

Public Grounds and Assignment of Rooms. Trustees Hungerford, Zmunt and Letts.

College Hospital and Sanitary Arrangements: Supt. Riggs, Zmunt and Wilson.

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GENERAL OFFICERS.

ALBERT BOYNTON STORMS, LL. D.,
President. Room 104, Central Building.

EDGAR WILLIAMS STANTON, LL. D.,
Secretary of Board of Trustees. Room 117, Central Building.

HERMAN KNAPP, B. S. A.
Treasurer and Registrar. Room 122, Central Building.

MISS VINA ELETHE CLARK,
Librarian. Morrill Hall.

ORANGE HOWARD CESSNA, D. D.,
Chaplain. Room 212, Central Building.

BEN EDWARDS,
Custodian. Office Building.

WARREN H. MEEKER, M. E.,
Superintendent of Heating and Lighting.
Room 202 Engineering Hall.

CHARLES G. TILDEN, M. D.,
College Physician and Sanitary Officer. Hospital Building.

DEANS AND VICE DEANS.

ALBERT BOYNTON STORMS, LL. D.,
Dean of the Division of Science. Room 104, Central Building.

EDGAR WILLIAMS STANTON, LL. D.,
Dean of the Junior College. Room 114, Central Building.

CHARLES FRANKLIN CURTISS, M. S. A., D. S.,
Dean of the Division of Agriculture. First Floor, Agricultural Hall.

ANSON MARSTON, C. E.,
Dean of the Division of Engineering. Room 315. Engineering Hall.

JOHN H. McNEIL, V. M. D.,
Dean of the Division of Veterinary Medicine, Second Floor.
Agricultural Hall.

MRS. MARIAN H. KILBOURNE, B. L.
Dean of Women, Margaret Hall.

SPENCER A. BEACH, B. S. A., M. S.,
Vice Dean of the Division of Agriculture, First Floor, Agricultural Hall.

SAMUEL WALKER BEYER, PH. D.,
Vice Dean of the Division of Engineering. Room 303 Engineering Hall.

MARIA M. ROBERTS, B. L.
Vice Dean of the Junior College. Room 218 Central Building.

AGRICULTURAL EXPERIMENT STATION.

CHARLES FRANKLIN CURTISS, M. S. A., D. S.,
Director. First Floor, Agricultural Hall.

WILLARD JOHN KENNEDY, B. S. A.,
Vice Director. First Floor, Agricultural Hall.

ENGINEERING EXPERIMENT STATION.

ANSON MARSTON, C. E.,
Director. Room 315, Engineering Hall.

THE FACULTY ORGANIZATION.

ALBERT BOYNTON STORMS, LL. D.,
President and Chairman of Sifting Committee and on Public Grounds. Room 104, Central Building.

HERMAN KNAPP, B. S. A.,
Secretary and Chairman of Committee on Catalogue and Diploma. Room 122, Central Building.

EDGAR WILLIAMS STANTON, LL. D.,
Chairman of Committee on Course of Study. Room 117, Central Building.

CHARLES FRANKLIN CURTISS, M. S. A., D. S.,
Chairman of Committee on Library. First Floor, Agricultural Hall.

ALFRED ALLEN BENNETT, M. S.,
Chairman of Committee on Examinations and Standings. Second Floor, Chemical Hall.

LOUIS HERMANN PAMMEL, PH. D.,
Chairman of Committee on Theses. Room 314, Central Building.

LOUIS BEVIER SPINNEY, M. S.
Chairman of Committee on Rules. Room 212, Engineering Hall.

SAMUEL WALKER BEYER, Ph. D.,
Chairman of Committee on College Athletics. Room 303, Engineering Hall.

HENRY ELIJAH SUMMERS, B. S.
Chairman of Committee on Post Graduate Study. First Floor, Morrill Hall.

RICHARD CORNELIUS BARRETT, M. A., LL. B.
Chairman of Committee on Entrance Requirements. Room 101, Central Building.

ADRIAN M. NEWENS, B. O.,
Chairman of Committee on Literary Societies. Room 311½ Central Building.

LOLA A. PLACEWAY, B. S.,
Chairman of Committee on Time Table. Second Floor, Chemical Hall.

J. A. McLEAN, B. A., B. S. A.,
Chairman of Committee on General Faculty Meetings. Room, First Floor, Agricultural Hall.

ORANGE HOWARD CESSNA, D. D.
Chairman of Committee on Student Affairs. Room 212 Central Building.

BENJAMIN H. HIBBARD, Ph. D.,
Chairman of Committee on Student Social Affairs. Room 223 Central Building.

SPENCER A. BEACH, M. S.,
Chairman of Committee on Faculty Social Affairs. Room First Floor Agricultural Hall.

OFFICERS OF INSTRUCTION

THE FACULTY.

ALBERT BOYNTON STORMS, A. M., D. D., LL. D.,
President, Dean of the Division of Science, 1903.*

EDGAR WILLIAMS STANTON, M. S., LL. D.,
Dean of the Junior College, Professor of Mathematics, 1877, 1874.

CHARLES FRANKLIN CURTISS, M. S. A., D. S.,
Dean of the Division of Agriculture, Director of Experiment Station, 1897, 1891.

ANSON MARSTON, C. E.,
Dean of the Division of Engineering, Professor of Civil Engineering, 1892.

JOHN H. McNEIL, V. M. D.,
Dean of the Division of Veterinary Medicine, Professor of Veterinary Medicine and Surgery, 1903, 1900.

HON. JAMES WILSON, M. S. A.,
Lecturer in Agriculture, 1902, 1891.

GENERAL JAMES RUSH LINCOLN,
Professor of Military Science, 1884.

ALFRED ALLEN BENNETT, M. S.,
Professor of Chemistry, 1885.

LOUIS HERMANN PAMMEL, B. Ag., M. S., Ph. D.,
Professor of Botany and General Bacteriology, 1889.

MISS LIZZIE MAY ALLIS, A. M.,
Professor of Modern Languages, 1896.

LOUIS BEVIER SPINNEY, B. M. E., M. S.,
Professor of Physics and Electrical Engineering, 1897, 1893.

SAMUEL WALKER BEYER, B. S., Ph. D.,
Vice Dean of the Division of Engineering, Professor of Geology and Mining Engineering, 1898, 1891.

ALVIN BUELL NOBLE, B. Ph.,
Professor of Rhetoric and Literature, 1898.

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*First date after the title indicates the date of appointment to present position, the second date, when the first fails to do so, indicates the date of first appointment in the college.

HENRY ELIJAH SUMMERS, B. S.,
Professor of Zoology, 1898.

GEORGE L. McKAY,
Professor of Dairying, 1900, 1894.

ORANGE HOWARD CESSNA, A. M., D. D.,
Professor of History and Psychology, 1900.

WILLARD JOHN KENNEDY, B. S. A.,
Professor of Animal Husbandry, 1901.

ADRIAN M. NEWENS, B. O.,
Professor of Public Speaking, 1902, 1896.

WILLIAM HENRY STEVENSON, A. B., B. S. A.,
Professor of Soils, 1903, 1902.

RICHARD CORNELIUS BARRETT, A. M., LL. B.,
Professor of Civics, 1904.

SPENCER A. BEACH, B. S. A., M. S.,
ice Dean of the Division of Agriculture, Professor of Horticulture, 1905.

BENJAMIN H. HIBBARD, B. Ag., Ph. D.,
Professor of Economic Science, 1906, 1902.

WARREN H. MEEKER, M. E.,
Professor of Mechanical Engineering, 1907, 1891.

FRED ALAN FISH, M. E. in E. E.,
Professor of Electrical Engineering, 1907, 1905.

J. BROWNLEE DAVIDSON, B. S., M. E.,
Professor of Agricultural Engineering, 1907, 1905.

MRS. ALICE DYNES FEULING, B. S.,
Professor of Domestic Economy, 1907.

ARTHUR MAC MURRAY, B. A., M. O.,
Professor of Public Speaking, 1908.

MISS MARIA M. ROBERTS, B. L.,
Associate Professor of Mathematics, 1904, 1891.

ARTHUR THOMAS ERWIN, B. S., M. S. A.,
Associate Professor of Horticulture, 1904, 1900.

MISS LOLA ANN PLACEWAY, B. S.,
Associate Professor of Chemistry, 1905, 1896.

M. L. BOWMAN, B. S. A.,
Associate Professor of Farm Crops, 1906, 1905.

FRANK WILLIAM BOUSKA, M. S. A.,
Associate Professor of Dairying, Dairy Bacteriologist, 1906, 1897.

*MISS VINA ELETHE CLARK,
Librarian, 1897.

MRS. MARIAN H. KILBOURNE, B. L.,
Dean of Women and Instructor in History of Art, 1900.

JOHN PIPER WATSON,
Physical Director, 1904.

C. B. STANTON, C. E.,
Associate Professor in Railway Engineering, 1907.

IRA ABRAHAM WILLIAMS, M. S., A. M.,
Associate Professor of Geology and Mining Engineering, 1907, 1898.

WILBUR M. WILSON, M. M. E.,
Associate Professor of Mechanical Engineering, 1907, 1901.

J. E. KIRKHAM, B. C. E.,
Associate Professor in Structural Engineering, 1907.

WINFRED F. COOVER, A. M.,
Associate Professor of Chemistry, 1907, 1904.

WAYNE DINSMORE, B. S. A.,
Associate Professor of Animal Husbandry, 1907, 1903.

R. R. DYKSTRA, D. V. M.,
Associate Professor of Anatomy and Obstetrics, 1907, 1905.

J. A. McLEAN, B. A., B. S. A.,
Associate Professor of Animal Husbandry, 1907, 1906.

LAURENCE C. HODSON, B. C. E., E. M.,
Associate Professor of Mining Engineering, 1907, 1906.

MISS HELEN DONOVAN,
Associate Professor of Domestic Economy, 1907, 1906.

CHARLES H. STANGE, D. V. M.,
Associate Professor of Histology, Pathology and Therapeutics, 1907.

CHARLES A. SCOTT, B. S. A.,
Associate Professor of Forestry, 1908.

MISS CAROLYN GRIMSBY, B. S.,
Acting Librarian, 1907, 1905.

HERMAN KNAPP, B. S. A.,
Registrar, 1887, 1883.

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*Leave of absence for the year 1907-8.

ASSISTANT PROFESSORS.

ALEXANDER STEWART THOMPSON,
Director of Music, Piano, Pipe Organ and Voice, 1907.

CLARA DUTTON THOMPSON,
Vice-Director, Voice, Preparatory Piano and Organ, 1907.

MISS ELIZABETH MACLEAN, M. D.,
Assistant Professor of English, 1903, 1899.

JOSEPH EDWARD GUTHRIE, M. S.,
Assistant Professor of Zoology, 1904, 1902.

IRA OBED SCHAUB, B. S.,
Assistant Professor of Soils, 1904.

MARK PERKINS CLEGHORN, B. S. in E. E.,
Assistant Professor of Mechanical Engineering, 1905, 1902.

THOMAS HARRIS MACDONALD, B. C. E.,
Assistant Professor of Civil Engineering in Charge of Good Road Investigations, 1905, 1904.

ADOLPH SHANE, B. S. in E. E.,
Assistant Professor of Electrical Engineering, 1904.

ERNEST ALANSON PATTENGILL, B. S.,
Assistant Professor of Mathematics, 1906, 1900.

MISS JULIA COLPITTS, A. M.,
Assistant Professor of Mathematics, 1906, 1900.

FRANK GILBERT ALLEN, B. S. in M. E.,
Assistant Professor of Mechanical Engineering, 1906, 1904.

ROBERT EARLE BUCHANAN, M. S.,
Assistant Professor of General Bacteriology, 1906, 1904.

HUGH G. VAN PELT, B. S. A.,
Assistant Professor of Animal Husbandry and Superintendent of Dairy Farm, 1906.

LOUIS BERNARD SCHMIDT, A. M.,
Assistant Professor of History, 1906.

MISS RUTH MORRISON, B. Ph.,
Assistant Professor of Domestic Economy, 1907, 1903.

ROY A. NORMAN, B. M. E.,
Assistant Professor of Mechanical Engineering, 1907.

HOWARD C. FORD, C. E.,
Assistant Professor of Surveying and Irrigation, 1907.

A. H. HOFFMAN, B. S. in E. E.,
Assistant Professor of Physics, 1907, 1905.

W. B. ANDERSON, M. S.,
Assistant Professor of Physics, 1907, 1905.

JOHN BOWER, B. S. A.,
Assistant Professor of Dairying, 1906.

WILLIAM E. MADSON, D. V. M.,
Assistant Professor of Physiology and Sanitary Science, 1907.

INSTRUCTORS.

EZRA CORNELIUS POTTER,
Instructor in Pattern Shop, 1898.

MISS ANNIE FLEMING, B. S.,
Instructor in Mathematics, 1900.

MISS GRACE ISABEL NORTON, B. A.,
Instructor in German, 1901.

WARD MURRAY JONES, B. C. E.,
Instructor in Mathematics, 1902.

JESSE GREENLEAF HUMMEL, B. M. E,.
Instructor in Machine Shop, 1903.

MISS FLORENCE LUCAS,
Instructor in French, 1903.

MISS LISLE McCOLLOM, B. A.,
Instructor in German, 1904.

MISS ELIZABETH MOORE, Ph. M.,
Instructor in English, 1904.

MISS SYBIL LENTNER, B. S.,
Instructor in Public Speaking, 1904.

MISS WINIFRED TILDEN, B. A.,
Instructor in Physical Culture, 1904.

MISS DORA GILBERT TOMPKINS, A. M.,
Instructor in English, 1905.

MISS ESTELLE DENNIS FOGEL, B. A., B. S.,
Instructor in Botany, 1906, 1904.

EDWARD MERRITT SPANGLER,
Instructor in Pattern Shop, 1905, 1904.

C. E. BARTHOLOMEW, M. S.,
Instructor in Entomology, 1905, 1904.

MISS ETHYL CESSNA, B. S.,
Instructor in History, 1905, 1904.

MISS KEO ANDERSON, B. S.,
Instructor in Mathematics, 1905.

MISS JULIA RAMSEY VAULX, A. M.,
Instructor in English, 1906.

MISS LOLA STEPHENS, B. S.,
Instructor in Chemistry, 1906, 1905.

CHARLES E. ELLIS, M. S. A.,
Instructor in Mining Engineering, 1906, 1903.

H. C. PIERCE,
Instructor in Animal Husbandry in Charge of Poultry, 1906.

ROY HIRAM PORTER, B. M. E.,
Instructor in Mechanical Engineering Laboratory, 1906.

L. E. CARTER, B. S. A.,
Instructor in Agricultural Journalism, 1906.

MISS CLARA BAKER, B. Ph.,
Instructor in English, 1906.

MISS LOUISE PETERS, A. M.,
Instructor in German and Spanish, 1907,

W. R. RAYMOND, B. A.,
Instructor in English, 1907.

INGEBORG LOMMEN, B. L., M. L.,
Instructor in German, 1907.

M. I. EVINGER, B. C. E.,
Instructor in Civil Engineering, 1907, 1906.

LAURA TAGGART, B. S,.
Instructor in Chemistry, 1907, 1906.

MELISSA FLYNN, B. S.,
Instructor in Chemistry, 1907, 1906.

WILLIAM KUNERTH, A. B.,
Instructor in Physics, 1907.

H. A. McCUNE, B. S. in E. E.,
Instructor in Physics and Electrical Engineering, 1907, 1906.

E. W. HAMILTON, B. S. A.,
Instructor in Agricultural Engineering, 1907.

HARRY G. BELL, B. S. A.,
Instructor in Farm Crops, 1907.

B. W. CROSSLEY, B. S. A.,
Instructor in Farm Crops, 1907.

FRANK M. OKEY, B. C. E.,
Instructor in Civil Engineering, 1907.

MISS HELEN F. SMITH, A. B.,
Instructor in Mathematics, 1907.

MISS MAUDE AGETON, B. A., B. S.,
Instructor in History, 1907.

JOHN E. BRINDLEY, A. M.,
Instructor in Economic Science, 1907.

MABEL CAMPBELL, B. S.,
Instructor in Domestic Economy, 1907, 1906.

HERMAN HORNEMAN,
Instructor in Dairying, 1907.

R. W. CRUM, B. C. E.,
Instructor in Civil Engineering, 1907.

MISS FREDRICA V. SHATTUCK, A. B.,
Instructor in Public Speaking, 1907.

MISS SADIE JACOBS, A. B.,
Instructor in English, 1907.

MISS GEORGIA HOPPER, B. A., PH. M.,
Instructor in German and Spanish, 1907.

JOSEPH B. VARELA,
Instructor in Mechanical Drawing, 1907.

JOSEPH FREDERICK BARKER, B. S. A.,
Instructor in Soils, 1908.

T. R. MINERT, B. M. E.,
Instructor in Mechanical Drawing, 1908.

HERBERT L. HOUSTON,
Violin and String Instruments.

RESIDENT LECTURERS.

GEORGE JUDISCH,
Lecturer on Pharmacy, 1901.

ASSISTANTS.

MISS HARRIETTE KELLOGG, A. M.,
Curator of the Herbarium, 1903.

JULIUS ERDMANN,
Gardener, 1904.

GEORGE MITCHELL,
Farm Foreman, 1906.

JOHN T. HOOVER,
Assistant in Agricultural Engineering, 1906.

HENRY NESS, B. S.,
Assistant in Zoology, 1906.

MARGARET FORGEUS, A. B.,
Library Cataloguer, 1906.

WINFIELD S. DUDGEON, B. S.,
Assistant in Botany, 1907, 1905.

E. N. WENTWORTH, B. S. A.,
Assistant in Animal Husbandry, 1907.

MISS EMMA LEONARD, B. S.,
Reference Librarian, 1907.

ORMA J. B. SMITH, B. S.,
Assistant in Horticulture, 1907.

MISS CAROLINE LAIRD,
Assistant Librarian, in Charge of Engineering Library.

LAURENZ GREEN, B. S.,
Assistant in Horticulture, 1907.

MISS LILLIAN M. LISTER,
Laboratory Assistant in Chemistry, 1907.

JOHN T. BATES, B. M. E.,
Instructor in Mechanical Laboratory, 1907.

R. E. CARR,
Assistant in Agricultural Engineering, 1907.

R. W. GETCHELL, B. S. A.,
Laboratory Assistant in Chemistry, 1907.

MISS MABEL RUNDALL, B. S.,
Assistant in English, 1907.

MISS MAY PARDEE, Ph. B.,
Assistant in English, 1907.

CHARLES L. MUNDHENK,
Brass Instruments.

J. W. CAMERON,
Instructor in Forge Work, 1907.

MRS. ELEANOR HOLLOWAY,
Assistant Librarian, 1907.

ROYAL JEFFS, B. S. A.,
Assistant in Botany, 1907.

JOHN SAWIN,
Instructor in Foundry, 1907.

J. WERSHOW, B. S., Ph. B.,
Laboratory Assistant in Chemistry, 1908.

R. M. DEMING, B. C. E.,
Assistant in Civil Engineering, 1908.

STUDENT ASSISTANTS.

A. E. BERGGREN,
Student Assistant in Machine Shops, 1905.

ADA HAYDEN,
Student Assistant in Botany, 1906.

H. F. WATT,
Student Assistant in Botany, 1907.

J. E. BOOTH,
Student Assistant in Engineering Library, 1907.

LOUISE LAURANCE,
Student Assistant in Domestic Economy, 1907.

PETER VAN GILST,
Student Assistant in Drawing, 1905.

LOUIS E. ORCUTT,
Student Assistant in English, 1908.

JESSE McKEEN,
Student Assistant in Chemical Laboratory.

N. LEERBERG,
Student Assistant in Machine Shops, 1906.

SHIRLEY W. ALLEN,
Student Assistant in Library, 1906.

NON-RESIDENT LECTURERS.

E. T. PERKINS,
"The Development of Government Irrigation in the West."

ISHAM RANDOLPH,
"The Isthmian Canal."

L. E. YOUNG,
"The Mining Engineer in the Mines."

L. E. TROEGER.

AGRICULTURAL EXPERIMENT STATION STAFF

ALBERT BOYNTON STORMS, A. M. D. D., LL. D.,
President Ex-Officio.

CHARLES FRANKLIN CURTISS, M. S. A., D. S.,
Director.

WILLARD JOHN KENNEDY, B. S. A.,
Vice Director and Animal Husbandry.

JOHN H. McNEIL, V. M. D.,
Veterinarian.

LOUIS HERMANN PAMMEL, B. Ag., M. S., Ph. D.,
Botanist.

HENRY ELIJAH SUMMERS, B. S.,
Entomologist.

GEORGE LEWIS McKAY,
Dairying.

WILLIAM HENRY STEVENSON, A. B., B. S. A.,
Soils.

LOUIS G. MICHAEL, B. S.,
Chemist.

SPENCER A. BEACH, B. S. A., M. S.,
Horticulturist.

ARTHUR T. ERWIN, B. S., M. S. A.,
Assistant Horticulturist.

J. BROWNLEE DAVIDSON, B. S., M. E.,
Agricultural Engineering.

M. L. BOWMAN, B. S. A.,
Farm Crops.

FRANK WILLIAM BOUSKA, M. S. A.,
Dairy Bacteriologist.

CHARLES A. SCOTT, B. S. A.,
Forester.

EDWIN ELIAS LITTLE, M. S. A.,
Assistant Horticulturist.

IRA OBED SCHAUB, B. S.,
Assistant in Soils.

HUGH G. VAN PELT, B. S. A.,
Assistant in Animal Husbandry.

J. A. McLEAN, B. A., B. S. A.,
Assistant in Animal Husbandry.

MISS CHARLOTTE KING,
Assistant in Botany.

MISS HARRIETTE KELLOGG, A. M.,
Assistant in Botany.

E. T. ROBBINS, B. S. A.,
Assistant in Animal Husbandry.

MATT L. KING, B. M. E.,
Experimentalist in Agricultural Engineering.

H. C. PIERCE,
Assistant in Animal Husbandry in Charge of Poultry.

L. C. BURNETT, M. S. A.,
Assistant in Farm Crops.

L. E. CARTER, B. S. A.,
Bulletin Editor.

JOHN H. CRISWELL, B. S.,
Assistant in Farm Crops.

ROBERT LORENZO WEBSTER,
Assistant in Entomology.

SCOTT S. FAY, B. S.,
Assistant in Soils.

STELLA HARTZELL, A. M.,
Assistant Chemist.

B. A. MADSON, B. S. A.,
Graduate Assistant in Chemistry.

ENGINEERING EXPERIMENT STATION

STATION COUNCIL.

(Appointed by the Board of Trustees).

ALBERT BOYNTON STORMS, A. M., D. D., LL. D.,
President.

ANSON MARSTON, C. E.,
Director.

LOUIS BEVIER SPINNEY, B. M. E., M. S.,

SAMUEL WALKER BEYER, B. S., PH. D.,

WARREN H. MEEKER, M. E.,
Professors.

ENGINEERING EXPERIMENT STATION STAFF.

ALBERT BOYNTON STORMS, A. M., D. D., LL. D.,
President, Ex-Officio.

ANSON MARSTON, C. E.,
Director and Civil Engineer.

LOUIS BEVIER SPINNEY, B. M. E., M. S.,
Electrical Engineer.

SAMUEL WALKER BEYER, B. S., PH. D.,
Mining Engineer.

WARREN H. MEEKER, M. E.,
Mechanical Engineer.

ALFRED ALLEN BENNETT, M. S.,
Chemist.

C. E. ELLIS, M. S. A.,
Assistant Chemist.

IRA ABRAHAM WILLIAMS, M. S., A. M.,
Assistant in Engineering Experiment Station.

M. I. EVINGER, B. C. E.,
Assistant in Engineering Experiment Station.

F. M. OKEY, B. C. E.,
Assistant in Engineering Experiment Station.

IOWA HIGHWAY COMMISSION

Section 1, Chapter 105 of the Laws of 1904 provides that the Iowa State College Agriculture and Mechanic Arts shall act as a Highway Commission for the State Iowa.

HIGHWAY COMMISSION STAFF.

ANSON MARSTON, C. E.,
CHARLES FRANKLIN CURTISS, M. S. A.,
Directors.

THOS. H. MACDONALD, B. C. E.,
Highway Engineer.

J. BROWNLEE DAVIDSON, B. S., M. E.,
Engineer of Road Machinery.

AGRICULTURAL EXTENSION

ALBERT BOYNTON STORMS, A. M., D. D., LL. D.,
President, Ex-Officio.

CHARLES FRANKLIN CURTISS, M. S. A.,
Dean of Agriculture, Ex-Officio.

AGRICULTURAL EXTENSION STAFF.

PERRY GREELEY HOLDEN, M. S., B. PD.,
Superintendent.

A. V. STORM, PH. B.,
Schools.

RALPH K. BLISS, B. S. A.,
Annimal Husbandry.

ADDISON H. SNYDER, B. S.,
Soils.

MARTIN L. MOSHER, B. S. A.,
Farm Crops.

R. E. DRENNAN, B. S. A.,
Animal Husbandry.

MISS EDITH G. CHARLTON,
Domestic Economy.

JAMES A. KING, A. B.,
Farm Crops.

MISS NEALE S. KNOWLES,
Domestic Economy.

ORGANIZATION AND HISTORY

The laws of the State of Iowa provide for the election by the general assembly of a Board of Trustees, one member from each congressional district, whose duty it shall be to manage and control the Iowa State College, at all times supporting the best interest of the institution.

The act establishing "A State Agricultural College and Model Farm" to be connected with the entire agricultural interests of the State was passed by the Legislature of Iowa in 1858. This legislature also appointed a board of commissioners to buy a farm and erect a college building, and elected a board of trustees to select a faculty and organize a college.

In 1859 a farm of six hundred and forty acres situated near Ames was purchased for the use of the College.

In 1862 a bill was passed by Congress, entitled, "An act donating public lands to the several States and Territories, which may provide colleges for the benefit of Agriculture and the Mechanic Arts."

Section 1 of this act provides that for the support of such colleges there be granted "an amount of public land, to be apportioned to each State in quantity equal to thirty thousand acres for each Senator and Representative in Congress to which the States are respectively entitled by the apportionment under the census of 1860; provided that no mineral lands shall be selected or purchased under the provisions of this act."

Section 4 requires: "That all moneys derived from the sale of land aforesaid by the States to which lands are apportioned, and from the sale of land script, hereinbefore provided for, shall constitute a perpetual fund, the capital of which shall remain forever undiminished (except as may be provided for in Section fifth of this act), and the interest of which shall inviolably be apportioned by each State which may take and claim the benefit of this act, to the endowment, support and maintenance of at least one college, where the leading object shall be without excluding other scientific and classical studies, and including military tactics, to teach such branches of learning as are related to agriculture and the mechanic arts, in such manner as the Legislature of the State may provide, in order to promote the liberal and practical education of the industrial classes in the several pursuits and professions of life."

Section 5 says: "And be it further enacted, that the grant of land and land script hereby authorized, shall be made on the following conditions, to which, as well as the provisions hereinbefore contained, the previous assent of the several States shall be signified by legislative acts; first, if any portion of the fund, invested as provided by the foregoing section, or any portion of the interest thereon, shall, by any action or contingency, be diminished or lost, it shall be replaced by the State to which it belongs; so that the capital of the fund shall remain forever undiminished; and the annual interest shall be regularly applied without diminution to the purposes mentioned in the fourth section of this act, except that a sum not exceeding ten per centum upon the amount received by any State under the provisions of this act may be expended for the purchase of land for sites or experimental farms, wherever authorized by the respective Legislatures of said States. Second, no portion of said fund nor the interest thereon shall be applied, directly or indirectly, under any pretense whatever, to the purchase, erection, preservation or repair of any building or buildings."

The General Assembly of Iowa, September 11, 1862, accepted the grant upon the conditions and under the restrictions contained in the act of Congress, and by so doing entered into contract with the General Government to erect and keep in repair all buildings necessary for the use of the College. By this action of the General Assembly the College was changed from an agricultural institution into a College of Agriculture and Mechanic Arts with the broad and liberal course of study outlined in the following paragraph.

In 1882 the General Assembly passed an act defining the course of study to be pursued as follows: Section 1. That Section 1621 of the Code is hereby repealed and the following is enacted in lieu thereof: "Section 1621. There shall be adopted and taught in the State Agricultural College, a broad, liberal and practical course of study, in which the leading branches of learning shall relate to agriculture and the mechanic arts, and which shall also embrace such other branches of learning as will most practically and liberally educate the agricultural and industrial classes in the several pursuits and professions of life, including military tactics. Section 2. That all acts, and parts of acts inconsistent with this act are hereby repealed."

August 30th the following act was approved by President Harrison: "Be it enacted by the Senate and House of Representatives of the United States in Congress assembled, that there shall be and hereby is, annually appropriated, out of any moneys in the treasury not otherwise appropriated, arising from the sales of public lands, to be paid as hereinafter provided, to each State and Territory for the more complete endowment and maintenance of colleges for the benefit of agriculture and the mechanic arts now established, or which may hereafter be established, in accordance with an act of Congress approved July second, eighteen hundred and sixty-two, the sum of fifteen thousand dollars for the year ending June thirtieth, eighteen hundred and ninety, and an annual increase of the amount of such appropriation thereafter for ten years by an additional sum of one thousand dollars over the preceding year, and the annual amount to be paid thereafter to each State and Territory shall be twenty-five thousand dollars, to be applied only to instruction in agriculture, the mechanic arts, the English language and the various branches of mathematical, physical, natural and economic sciences, with special eference to their application in the industries of life, and to facilities for uch instruction."

The income of the College from National grants is therefore expended in instruction, experimentation and illustration in agriculture and in the mechanic arts, and in underlying and related science and literature.

All buildings are erected and all repairs thereon are made by the State of Iowa, the cost down to date being about $1,150,000.

The College was formally opened on the 17th of March, 1869.

THE SCOPE

The Iowa State College of Agriculture and Mechanic Arts seeks to aid the young men and women in the acquirement of a higher education. Instruction is given in the culture studies and sciences, together with such experimental work as to enable the students to successfully engage in a practical profession. Throughout the several courses, the study of the textbook is supplemented by lectures, discussions, library work, and the practical experimental work of the laboratory. The instruction is not merely theoretical but also practical—the student verifying and putting into practice in the laboratory the instruction received.

The Iowa State College offers thirteen four year courses leading to the following degrees:

Course in Agronomy, leading to the degree of Bachelor of Scientific Agriculture (B. S. A.).

Course in Dairying, leading to the degree of Bachelor of Scientific Agriculture (B. S. A.).

Course in Animal Husbandry, leading to the degree of Bachelor of Scientific Agriculture (B. S. A.).

Course in Horticulture and Forestry, leading to the degree of Bachelor of Scientific Agriculture (B. S. A.).

Course in Science and Agriculture, leading to the degree of Bachelor of Scientific Agriculture (B. S. A.).

Course in Veterinary Medicine, leading to the degree of Doctor of Veterinary Medicine (D. V. M.).

Course in Mechanical Engineering, leading to the degree of Bachelor of Mechanical Engineering (B. M. E.).

Course in Civil Engineering, leading to the degree of Bachelor of Civil Engineering (B. C. E.).

Course in Electrical Engineering, leading to the degree of Bachelor of Science in Electrical Engineering (B. S. in E. E.).

Course in Mining Engineering, leading to the degree of Bachelor of Science in Mining Engineering (B. S. in Mn. E.).

Course in Ceramics, leading to the degree of Bachelor of Mining Engineering in Ceramics (B. E. M. in Cer.).

Course in General Science, leading to the degree of Bachelor of Science (B. S.).

Course in Domestic Economy, leading to the degree of Bachelor of Science in Domestic Economy (B. S. in D. E.).

The degree of Bachelor of Agricultural Engineering (B. A. E.) is given to students who have completed a four year course in Civil, Mechanical, or Electrical Engineering, followed by one year's prescribed work approved by the faculty, in Agricultural Engineering and related sciences, under the rules and conditions governing work in other courses.

Two year courses are also offered in Mining Engineering and Clay Working, and a one year course in Poultry Husbandry, for the completion of which, certificates will be given. That many, who are unable to take the full college course, may take advantage of the advancement being made in their chosen work, a two weeks' short course is now offered each year during the winter vacation in Stock and Grain Judging and Dairying. A School of Good Road Investigations is also held during each summer vacation. The interest in all of these short courses is becoming greater, the attendance is increasing and the benefits to be derived from them are constantly increasing.

LOCATION.

The College occupies a delightful and healthful location upon high rolling land in the west part of Ames, Story County. Situated at the junction of the north and south branch and the main double-track line of the Chicago & Northwestern Railroad and connected with all the trunk lines of Iowa, Ames is easily accessible from all parts of the State. An electric railway connects Ames and the College with efficient service. Ames is a most desirable town for wholesome college influences. Its people are thrifty, enterprising and cordial. The town has an excellent system of public schools, numerous churches, water works, electric lights and a good city government. It is an inviting community for families who wish to educate their children, enjoy the better elements of society and an environment of reasonable expense. Ames and the College are on very cordial terms, and its citizens seek to promote the efforts of the students and the highest interest of the College.

THE COLLEGE GROUNDS.

Of the entire College domain of 1200 acres, 125 acres are set apart for College grounds. These include the experimental plots, the young forestry plantations, the surroundings of the professors' dwellings and the central campus with its beautiful winding walks and drives, its trees, shrubbery and flower gardens, and its large and stately college buildings. The true principles of landscape gardening have been so faithfully observed in the gardening and in the location of buildings and drives as to make the entire campus a large and beautiful park.

BUILDINGS.

Twenty-three commodious buildings have been erected by the State for the exclusive use of the various departments of the College, besides the dwelling houses and buildings for farm stock, machinery and work. All of these buildings are heated by steam, lighted by electricity, and supplied with pure water.

New Central: The New Central Building which has been erected on the site of the Old Main accommodates the Executive Offices, the departments of English, Civics, Modern Languages, Economic Science, History, Mathematics, Public Speaking, Botany and General Bacteriology. The building is of buff Bedford stone, built in the Roman Renaissance style, which style has been adopted for the Central Building, and the Engineering and new Agricultural Halls. The building completed and furnished cost about $375,000.00.

Engineering Hall: The Engineering Departments occupy the new Engineering Hall. This is a fire-proof building in which all the engineering departments have offices, recitation and lecture rooms, laboratories and engineering museum. It is of Bedford stone, has plate glass windows, and modern conveniences and furnishings throughout. This building, costing $220,000.00, is the best engineering building west of the Mississippi river.

Agricultural Hall: This is a four story building, the lower stories of stone and the upper of brick. It contains recitation rooms of the divisions of Agriculture and Veterinary Science, offices of the Experiment Station and sewing rooms of the Domestic Economy department.

Morrill Hall: Morrill Hall, one of the oldest of the College buildings, was named in honor of Hon. Justin S. Morrill, the originator of the "Land Grant" for Colleges of Agriculture and Mechanic Arts. It is of deep red brick with stone, brick and terra cotta trimmings. In it are the College Chapel, Library and Zoological Museum, lecture rooms and laboratories.

Margaret Hall: Margaret Hall, the home of the young women of the College, occupies one of the most pleasing locations on the campus. It is built of brick, roofed with slate, provided with steam heat, electric lights, baths and large parlor. The hall will accommodate about one hundred girls, to whom the rooms will be assigned in the order of their application. The privilege of rooming in Margaret Hall is reserved for regular students. In connection with the hall there are two clubs at which the girls may obtain board at a reasonable rate. The young women are under the direction of an efficient dean of women. The department of Domestic Economy is also located in this building.

Dairy Building: This is a three story building built of pressed brick, trimmed with Bedford stone containing factory butter and cheese rooms, bottling room, refrigerators, lunch room, offices, research laboratory, farm dairy room, students testing laboratory, lecture room, dairy reading room, and bacteriological laboratory for research and investigation.

Chemical Hall: A three story brick building furnished with steam heat, water, gas and laboratory equipment accommodating 600 students in Chemistry.

Station Barn: The Experiment Station barn is one of the best and most modern buildings of its kind to be found anywhere in the world. It is veneered with buff pressed brick, has a slate roof, paved brick floors and is in every respect entirely fire proof. The building is devoted to the housing of beef and dairy cattle and horses, for storage of vehicles and machinery, storage and grinding room for feed, seed rooms for the drying of corn and the storage of grain and feed stuffs used in experimental work.

Judging Pavilion: In connection with the experimental barn is a two story octagonal judging pavilion. It is built of buff pressed brick with a slate roof. The lower story is used for stock judging, and the upper for grain judging. This building, thoroughly equipped in every way, is conceded to be the best building of its kind on the continent.

Horticultural Laboratory: This is a two-story brick building connected with the greenhouse. The main floor, accommodating fifty students, is especially fitted for the study of fruits. The building is equipped with two refrigerators, one for experimental work in cold storage and the other for storing fruits for class purposes. The second floor contains the horticultural museum and facilities for photography.

Greenhouses: The present plant contains 10,000 square feet under glass. The houses are of cypress construction, supported by a steel structure. They are heated by steam, operated on the Paul system, with varying temperatures for the propagating house, growing houses, and seed testing houses. The houses also include four commodious work rooms used in potting, transplanting and other necessary work.

Agricultural Engineering Building: This is a four story, fire proof building, built of steel and pressed brick, costing when equipped about $70,000.00. It accommodates the workshops, tool rooms, blacksmith shop, carpenter shop, drafting room, reading room, rooms for the study and exhibition of various farm implements, offices and class rooms, bulletin rooms and a photographic department.

Engineering Laboratory: This is a brick four story building, including basement and large "L," containing machine shops, and the engineering laboratory for the departments of Civil and Mechanical Engineering.

Wood Shop: This is a brick building containing carpenter and pattern shops, with power and hand tools complete for wood work, and outfit of tools for individual work.

Forge Shop and Foundry: A brick building containing complete equipment for forging and moulding.

Power House: This is a brick, one story building, containing the dynamos and motor power for electrical engineering, the deep well pump, the engine and boiler furnishing power for the shops, and also accommodates the experimental work in the course in Mechanical Engineering.

Veterinary Hospital: This is a brick, three story building, containing offices and dissecting rooms, and is well equipped for conducting clinical as well as general hospital work.

Horse Barns and Stock Pavilion: The barn, built of brick with a slate roof, is for horses, the storage of grain and general farm purposes. The Stock Pavilion is also of brick, is circular in form, well heated and lighted, accommodates several hundred students at a time, and affords first class advantages for stock judging and animal husbandry.

Locomotive Laboratory: This building contains an eight-wheeled locomotive and tender presented by the Chicago & Northwestern Railway Company.

Sanitary Hall: A frame, two story building, containing offices, kitchen and dining room for the hospital patients, and rooms for the sick and convalescent.

Music Hall: This is a brick, two story building, fitted up with apparatus and instruments for practice and instruction.

Dwelling Houses: There are also on the Campus eighteen comfortable dwelling houses occupied by professors' families, and several others by foremen and employees.

Other Buildings: Stables, barns, sheep and swine and seed houses sufficient for the requirements of the farm, are conveniently grouped near the College campus.

ADMISSION TO THE COLLEGE

Methods of Admission.

Students are admitted upon the presentation of a certificate from schools or colleges, or by examination at the College.

Admission by Certificate.

Students entering the Freshman class by certificate from accredited high schools or colleges must present specific certificates showing amount and grade of work done and text-books used in the subjects required for entrance. Such certificate showing the successful completion of the amount of work required in the various subjects for entrance to the College will be accepted and the student admitted to the Freshman class without examination.

Superintendents and Principals are urged to send to the College immediately upon the close of the school year the Uniform Admission Certificate of each graduate intending to enter the College at the beginning of the ensuing College year. If on inspection the certificate is found satisfactory the applicant will be forwarded a certificate entitling him to admission without examination. Uniform Admission Certificates may be had by teachers and students upon application.

Graduates of schools fully accredited by other colleges which have as high a standard of entrance requirements as this institution will also be admitted as Freshmen upon presentation of certificates of graduation, accompanied with Uniform Admission Certificate.

College Credit for Work Done Elsewhere.

Graduate and under-graduate students of other colleges will be admitted and granted such credits as their work will justify. Work of recognized merit that has been taken at other colleges or universities of good rank and standing will be credited for an equivalent amount of work so far as it applies in any of the courses offered in this college. Credits allowed, may at the option of the heads of departments, be conditioned on satisfactory work during the student's first semester in college.

The following form should be used by those seeking advanced credits:

........................College

Date, ...

THIS IS TO CERTIFY, That .... of .... has been a student in .... College, and has the following grades on the records of this institution:

Name of Subject	Name of Text-book Used, or Lecturer	No. of Weeks Pupil Studied Subject in This class	Grade	No. of Recitations Per Week

Remarks.

Amount and kind of Laboratory work ....

....

....

President or Recorder.

Adult Special Students are admitted in accordance with the provisions found under Special Students. See Index.

Admission by Examination.

Students desiring to enter by examination will be given such examinations upon any subject required for entrance upon presentation of satisfactory evidence of having devoted sufficient time in the preparation of such subjects.

Examinations for entrance to College will be conducted at the opening of each semester on the Tuesday and Wednesday preceding classification.

Entrance Examination Periods:

Tuesday.

8-10 A. M.—Public Speaking. Room 308, Central Building.
10-12 A. M.—English. Rooms 1 and 3, Central Building.
1-3 P. M.—Language. Room 119, Central Building.
3-5 P. M.—Botany. Room 312, Central Building.

Wednesday.

8-10 A. M.—Mathematics. Room 221, Central Building.
10-12 A. M.—History. Room 208, Central Building.
1-3 P. M.—Civics. Room 102, Central Building.
3-5 P. M.—Language. Room 119, Central Building.

The Freshman work will be of such grade that a graduate of an accredited school can reasonably be expected to be prepared to carry it creditably. All students are urged to review thoroughly at high school or elsewhere Algebra and English Grammar just before entering. Diplomas of graduation will not be accepted for entrance unless accompanied by certificates as stated above.

ENTRANCE REQUIREMENTS.

The requirements for admission are stated in terms of credits. The term credit means the equivalent of five forty or fifty-minute recitations per week in a given subject for a term of eighteen weeks, adequate time being given to the preparation of each lesson.

Students desiring admission to the Freshman year must present thirty credits. Of these, certain are required and the balance elective, as stated below under requirements for admission to the several divisions of the College.

A. The following 17 credits are required of all entering the courses in Agriculture, Engineering and Science:

Mathematics,	Credits
Algebra	3
Geometry, plane	2
English	6
History	2
*Foreign Language	
German, French, Spanish or Latin	4

B. Electives.

Agriculture, Elements of	1
Astronomy	1
Bookkeeping	1 or 2
Botany	1 or 2
Business Arithmetic	1 or 2
Chemistry	1 or 2
Civics	1 or 2

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*Students may be admitted without Foreign Language under the following conditions:

1. The student must offer all of the required credits except the four in Foreign Language, together with sufficient elective credits to make a total of thirty.

2. The language requirements must be made up before graduation. It will ordinarily require, if taken in College, extra work to the extent of five hours a week for one year. This extra work will not be credited as part of the credit hours required for graduation in the several courses. Opportunity for making up deficiencies in language will be offered by the College.

Commercial Geography	1
Drawing, freehand or perspective	1 or 2
English	1 or 2
Geology	1 or 2
German	2 or 4
Greek	2 or 4
History	2 or 4
Latin	2 or 4
Manual Training	1, 2 or 3
Mathematics	1 or 2
Mechanical Drawing	1, 2 or 3
Mental Arithmetic	1
Optional	2
Physics	2
Physical Geography	1 or 2
Physiology	1 or 2
Political Economy	1 or 2
Spanish	2 or 4
Stenography	1 or 2
Zoology	1 or 2

Limitations. Not more than four elective credits will be accepted in Foreign Language or any other one subject. No Foreign Language course of less than two credits will be accepted from students presenting only one foreign language.

Optional Subjects. An optional subject is any subject of the student's high school course not specified in the list of elective subjects.

REQUIREMENTS FOR ADMISSION TO THE SEVERAL DIVISIONS OF THE COLLEGE.

Division of Agriculture.

Required Credits:

Algebra	3
Geometry, plane	2
English	6
History	2
*German, French, Spanish or Latin	4
Science	1
	18

Elective Credits:

The remainder of the thirty necessary credits must be made up by elections from B. Electives.

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*See Notes 1 and 2 under Entrance Requirements Page 36.

Division of Engineering.

Required Credits:

Algebra	3
Geometry, plane	2
Geometry, solid	1
English	6
History	2
*German, French, Spanish or Latin	4
	18

Elective Credits:

The remainder of the necessary credits must be made up by elections taken from B. Electives.

Division of Science.

Required Credits:

Algebra	3
Geometry, plane	2
Science	1
English	6
History	2
*German, French, Spanish or Latin	4
	18

Elective Credits:

The remainder of the necessary credits must be made up from elections taken from B. Electives.

Division of Veterinary Medicine.

Candidates having a college degree, diploma from an accredited high school or those who have passed successfully the matriculate examination of a recognized college will be admitted without examination.

Graduates from recognized schools of Veterinary Science, Agriculture, Medicine, Dentistry, or Pharmacy will be given credit for the work pertaining to the course, upon the presentation to the faculty of satisfactory standing or upon passing an entrance examination.

General Statement Concerning Entrance Credits.

Students and others desirous of learning something of the amount and kind of work required for entrance to Freshman classes will find suggestive outlines below for some of the most important subjects.

MATHEMATICS.

Following the policy of other institutions, this College accepts three credits in Algebra, two in plane geometry, and, in the Engineering Courses,

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*See Notes 1 and 2 under Entrance Requirements Page 36.

one in solid geometry as meeting its entrance requirements in mathematics. Experience shows us however that those students are best prepared who have taken this work in the preparatory school in order as follows:

(a) Algebra, two credits:

Addition, subtraction, multiplication, division, factoring, highest common factor, lowest common multiple, fractions, simple equations (with one two and several unknown quantities), followed by problems, theory of exponents, involution, evolution, radicals, inequalities, radicals, quadratics (with one or two unknown quantities) and problems involving quadratics.

(b) Plane Geometry, two credits:

The work on this part of the subject is such as is given in any standard text in geometry including a large number of exercises.

(c) Solid Geometry, one credit:

This should cover the same ground as that included in any good text, including originals.

(d) Review Algebra, one credit:

While this subject does not include any topic not named under elementary algebra, a much fuller treatment of these subjects is expected in this work. Principles as well as processes should be learned; theorems and rules should be rigorously demonstrated; the exercises and problems should be more difficult; and students should be drilled in short methods and rapid and accurate work.

This review in algebra should be given in the last year of the high school, when the student has the maturity gained by age and the broader reasoning powers acquired from geometrical training. Such a review immediately before entering college will give the student a broader and more comprehensive knowledge, will make clear to him many things which he did not understand when he first went over them, and will equip him with better and more rapid methods of work. Experience has proven the statement true that "It is not sufficient that a student *should once have known* his preparatory mathematics; he must know them *at the time when he begins his work here.*"

(e) Additional Credits:

Certain schools in the state use three semesters for the work of course (a) and give the review in the senior year in addition. Since this gives the student a much more thorough foundation and is particularly desirable, especially in the engineering courses, an additional elective credit is given when such work is taken.

ENGLISH.

The six credits required in English include the following subjects, and should provide the training indicated below.

1. Composition and Rhetoric, two credits:

The constant aim in this study should be to acquire the habit of clear and correct expression. To secure this result the fundamental principles of rhetoric should be taught not as an end, but as a means to an end—the development of skill; not as definitions to be memorized, but as rules to be applied in actual composition. Accordingly the course should require constant practice in writing, followed by careful revision and correction of mistakes. The topics for themes may be drawn in part from other studies, such as literature and history, but in the main they should rest upon experience and observation, in order that the student may be trained to clear, correct, and effective self-expression. In all his writing he should cultivate habits of correct spelling, sentence-structure, punctuation, and paragraphing. Should his freshman themes prove defective in these respects, the college reserves the right to require him to make up his deficiences.

2. English and American Literature, three credits:

Reading of Classics. The following books are recommended by the Joint Conference on Uniform Entrance Requirements in English, and the list has been accepted by practically all the colleges in the United States.

1908-1911.

(a) **For Reading,** ten books selected from the following list:

Group I. (Two to be selected. Shakespeare's *As You Like It, Henry V, Julius Caesar, The Merchant of Venice, Twelfth Night.*

Group II. (One to be selected). Bacon's *Essays,* Bunyan's *The Pilgrim's Progress,* Part 1; *The Sir Roger de Coverly Papers* in the Spectator; Franklin's *Autobiography.*

Group III. (One to be selected). Chaucer's *Prologue;* Spencer's *Faerie Queene,* (selections); Pope's *The Rape of the Lock;* Goldsmith's *The Deserted Village;* Palgrave's *Golden Treasury* (First series) Books II and III, with especial attention to Dryden, Collins, Gray, Cowper and Burns.

Group IV. (Two to be selected). Goldsmith's *The Vicar of Wakefield;* Scott's *Ivanhoe;* Scott's *Quentin Durward;* Hawthorne's *The House of Seven Gables;* Thackeray's *Henry Esmond;* Mrs. Gaskell's *Cranford;* Dickens' *A Tale of Two Cities;* George Eliot's *Silas Marner;* Blackmore's *Lorna Doone.*

Group V. (Two to be selected). Irving's *Sketch Book;* Lamb's *Essays of Elia;* De Quincey's *Joan of Arc* and *The English Mail Coach;* Carlyle's *Heroes and Hero Worship;* Emerson's *Essays* (selected); Ruskin's *Sesame and Lilies.*

Group VI. (Two to be selected). Coleridge's *The Ancient Mariner;* Scott's *The Lady of the Lake;* Byron's *Mazeppa* and *The Prisoner of Chillon;* Palgrave's *Golden Treasury* (First series) Book IV., with especial attention to Wordsworth, Keats, and Shelley; Macaulay's *Lays of Ancient Rome;* Poe's *Poems;* Lowell's *The Vision of Sir Launfal;* Arnold's *Sohrab and Rustum;* Longfellow's *The Courtship of Miles Standish;* Tennyson's *Gareth and Lynette, Lancelot and Elaine,* and *The Passing of Arthur;* Browning's *Cavalier Tunes, The Lost Leader, How they Brought the Good News from Ghent to Aix, Evelyn Hope, Home Thoughts from Abroad, Home Thoughts from the Sea, Incident of the French Camp, The Boy and the Angel, One Word More, Herve Riel, Pheidippides.*

(b) **For study and practice:** Shakespeare's *Macbeth;* Milton's *Lycidas, Comus, L'Allegro,* and *Il Penseroso;* Burke's *Speech on Conciliation with America,* or *Washington's Farewell Address* and Webster's *First Bunker Hill Oration;* Macaulay's *Life of Johnson,* or Carlyle's *Essay on Burns.*

In the study of the books prescribed above the constant aim should be to develop the student's power of appreciation. He should be trained to observe for himself, to analyze for himself, to reach judgments of his own. One excellent method is to give with each assignment specific questions directing attention to certain qualities of thought or plan or style. In this way the student may be trained to observe the fundamental qualities and principles of literary expression. The selecting of appropriate epithets and figures of speech, of beautiful, suggestive, or forcible phrases, of qualities that make style now easy or familiar, now ornate, dignified, or forcible, will develop a sense of literary values, and cultivate the power of literary appreciation. Moreover, by such study the student will insensibly strengthen and enrich his power of self-expression. Having been trained to see and to appreciate clearness, force, and beauty, he will strive to develop these qualities in his own writing, and literature will acquire an added interest through a sense of the power it may confer. In other words the student should come to feel the utility of literature as well as its beauty. The teacher who appreciates that development is the end to be sought, will guard against giving ready-made judgements, which may injure by forstalling investigation. Properly taught, literature calls for observation, analysis, comparison, as truly and as constantly as does botany. The teacher's function is largely to direct this observation. Manuals of literature, however excellent, should be treated as subsidiary. Biographical details may be helpful in stimulating interest, the conditions of the time may supply the setting, but the thing to be *studied* is the book itself.

3. Grammar, one credit.

In the last year of the high school course there should be a thorough review of grammar, extending through one semester. Prior to this time in the course the student is not mature enough to master the more difficult relations of the sentence, or to appreciate how necessary a clear knowledge of sentence structure is to real progress in composition. If the student does not understand the structure of the sentence, he cannot reasonably be expected to frame sentences that are correct in structure or to learn to construct better sentences; thus his ignorance of grammatical relations prevents real progress in composition.

The percentage of failures in the first course in college composition, would be materially reduced if grammar were more thoroughly reviewed in the last year of the high school course. From this review the student should be helped in the following ways:

a. He should be trained to analyze good modern prose, sentence by sentence, from such authors as Addison, Macaulay, Hawthorne, and Stevenson. He should be trained to observe clearness, emphasis, unity, climax, variety, and other qualities in sentence structure, and to note the effect of different types of sentence—short, long, balanced, loose, and periodic.

b. He should also be trained to construct sentences of all types. One very helpful method is for the teacher to give out in analyzed form well-constructed sentences of the various types, and require the student to arrange these elements in the best order for clearness, emphasis, balance, climax, etc. Most students find this constructive work more interesting than the analytical, and also more helpful.

c. He should also be trained to analyze the sentences of his own essays, to note sameness or variety in sentence length and form, also clearness, emphasis, balance, and other qualities essential to effective expression. It is not assumed that his high school course in English will make him a master sentence-builder, but it should give him sufficient knowledge and practice to make his every sentence clear and correct, and it should start him on the road to mastery of sentence construction.

4. Elective Credits in English.

Students who present the required credits set forth above, may also receive two elective credits for additional work. Such credits will be granted for more extended study of English or American Classics, or for the study of a good History of Literature, supplemented by study of some of the minor authors not previously studied, or by more minute or more extended study of the major authors.

HISTORY.

It is recommended that emphasis be put on history in the High Schools along the line suggested by the Report on History in Schools by the Committee of Seven of the American Historical Association, and that not less than two years be given to the subject. The following would be a suggestive course: One year in Greek and Roman History; one semester in English History, or Modern History with special emphasis on English history; one semester on American History. If a three years course be given then devote a year to each of the above. If a four years course be given the following course would be suggested: One year each to the following subjects: Greek and Roman History, to 800 A. D., Mediaeval and Modern from 800 A. D., English History, American History.

In all the above there should be the use of the best modern texts and outside reading with notes, and some instruction in historical geography.

The American History given in the Academic year at the State College is what is usually given in the fourth year of the High School after the pupil has had European or English History in the preceding years. It is recommended that students contemplating entering this College take Advanced American History in the fourth year of the High School. The sample questions will indicate the general scope of the work.

MODERN LANGUAGES.

In the case of each of the three modern languages which may be offered for admission, a course of study is suggested. What the College demands is proficiency in the subject rather than a particular course of study, and the courses are outlined simply to indicate how the necessary proficiency may be attained.

German. During the first year the work in German should comprise: "German Lesson Grammar," Joynes and Wesselhoeft. The reading of from seventy-five to one hundred pages of graduated texts. The student should be taught to read with ease such texts as Storm's "Immensee."

(1) The principles of German Grammar should be thoroughly mastered; (2) There should be abundant exercise in composition, reading and conversation; (3) Careful drill upon pronunciation; (4) The memorizing and frequent repetition of easy colloquial sentences; (5) drill upon the inflections of the articles, of such nouns as belong to the language of everyday life, of adjectives, pronouns, weak verbs and the usual strong verbs, the use of the common prepositions, the modal auxiliaries, the passive voice, and the subjunctive mood, and the elementary rules of syntax and word order.

During the second year the work should comprise: (1) the reading of good literature in the form of stories and plays—as "Hoher als die Kirchie," Hillern, "Willkommen in Deutschland," Mosher and "Wilhelm Tell," Schiller; (2) accompanying practice in the translation into German of variations upon the matter read; (3) continued drill upon the rudiments of the grammar.

French. During the first year the work in French should comprise: (1) a thorough knowledge of grammar principles, as given in Fraser and Squair's French Grammar; (2) careful drill in correct pronunciation; (3) composition, conversation and dictation, based upon French Prose

Composition by Francois; (4) thorough course in irregular verbs; (5) "Sans Famille," Malot.

During the second year the work should comprise: (1) "Mon Oncle et Mon Cure," La Brete, "La Chute," Hugo, Tales of Manpassant and Zola, Le "Chevalier de Maison Rouge," Dumas; (2) prose composition, conversation and dictation.

Spanish. During the first year the work in Spanish should comprise: (1) "First Spanish Book and Reader," Giese; (2) "Metodo Berlitz," with frequent exercises in composition, conversation and dictation.

During the second year the work should comprise: (1) Review of grammar with exercises; (2) "El Capitan Veneno," "Dona Perfecta," Galledos Alarcon. (3) Constant reading of the Spanish is required with careful drill in correct pronunciation.

BOTANY.

The student should master the principles of the general morphology of flowering plants and the terms commonly used in descriptive botany, as well as the determination of our common flowering plants. The high school should offer laboratory work along with Leavitt's Lessons, or Bergen & Davis' "Principles of Botany," or Coulter's "Text-Book of Botany," or any other work covering the same general ground.

SUGGESTIVE LIST OF EXAMINATION QUESTIONS.

For Entrance by Examination into the Freshman Year.

ALGEBRA.

1. From $5xy-(m-n)\ (k+1)-(a+b)\ (d+c)$ subtract $(d+c)\ (a-b)+5\ (k+1)-acy-mny$.

2. Remove the parentheses and simplify.

$$7x^2\left\{\frac{a+b}{c-d}-y-4-(n-m)\right\}-\left\{\frac{2(y+4)}{3}-7x^2-\frac{a+b}{c-d}-\overline{m-8+n}\right\}+8$$

State the rule by which parentheses preceded by the plus or minus sign are removed.

3. Divide $-45a^{1-x}b^{-2}c^x(m+n)^5+ab^xc^{1+x}(m^2+2mn+n^2)^3$ by $3a^7b^2c^x(m+n)^3$.

4. Write the product of $(3x-2)\ (3x+5)$, of $(2x+2)\ (2x+2)$, and also of $(3y+1)\ (3y-1)$ and give the special rules of multiplication used.

5. Resolve $a^{12}-a^8b^4-a^4b^8+b^{12}$ into its prime factors.

6. Find the lowest common multiple of
$2x^4+3x^3+3x-2$ and $3x^4+5x^3+x^2+5x-2$.

7. Simplify

$$\frac{a^2-b}{(a-b)\ (a-1)}+\frac{b^2+a}{(b+1)\ (b-a)}+\frac{1+ab}{(1-a)\ (1+b)}$$

What is the effect on a fraction of changing:

(a) Any two of the three following signs: sign of numerator, sign of denominator, or apparent sign of the fraction.

(b) The signs of an odd number of factors in the numerator.

(c) The signs of an even number of factors in the numerator.

8. Solve the following equation:

$$\frac{x-\dfrac{3(x-5)}{4}}{8}-\frac{x-3}{4}=x+1-\frac{8x-\dfrac{2(x+16)}{17}}{6}$$

9. A man rowing at a certain rate makes the round trip from A up stream to B, 24 miles distant, and return, in 5 hours. Having six hours at his disposal, he starts to make the trip, but when 16 miles from A, the boat springs a leak which causes him to land. In so doing he loses 40 minutes, but by walking at three-fourths the speed the boat would have carried him, he is able to spend an hour in B, and reach home in the required time by a train moving at twice the speed which the boat would have moved down stream. What is the rate in miles per hour of the man rowing in still water and what is the rate of the current?

10. Find the values of a and b in the following:

$$\frac{3}{2a}-\frac{4b}{b-2a+3}=2\tfrac{1}{2}$$

$$\frac{1}{a}+\frac{1}{b-2a+3}=-\tfrac{1}{6}$$

11. Find the value of $(-5a-yb^{k+1}c^3)^{-3}$ freeing the result of negative exponents.

12. Find the cube root of:

$$8a^{\frac{3}{2}}-12a\tfrac{1}{2}+42a^{-\frac{1}{2}}-\tfrac{1}{2}-37a^{-\frac{3}{2}}+63a^{-\frac{5}{2}}-27a^{-\frac{7}{2}}+27a^{-\frac{9}{2}}.$$

13. Find the sum of $\sqrt[3]{54x^{a-3}y^6}$, $\sqrt[3]{16x^{a+6}y^3}$ and $\sqrt[3]{2x^{4a+9}}$.

14. Multiply $\sqrt[2n]{x^3}$ by $\sqrt[n]{x}$ by $\sqrt[3n]{x^2}$

15. Find the cube root of $\frac{3}{5}\sqrt{\frac{3}{5}}$

16. Multiply $\sqrt{2}-3\sqrt{-5}$ by $\sqrt{5}+\sqrt{-3}$

17. Find the square root of the binominal surd $67+7\sqrt{72}$

18. Solve $\sqrt{x^2-6x}-5\sqrt[4]{x^2-6x}+6=0$

19. Solve $9x^2-5xy=21$ and $xy-y^2=-4$, solving for x and y.

20. Two trains starting at the same time and going in opposite directions between M and N, upon meeting, have differed in the dis-

tance covered by 20 miles. It is found that the train from M will reach N in one and one-half hours from the time of meeting and the train from N will reach M in 40 minutes. How far apart are M and N, and what is the rate of each train?

ENGLISH.

The examinations in English will include questions in grammar and elementary rhetoric and also one or more essays, to test the student's readiness and accuracy of expression. The following list of questions indicates the general nature of the examination:

I. In the following sentence, (a) state the exact grammatical relationship of each phrase and clause; (b) parse the words in black; (c) account for punctuation. "**What** if their palaces were grand, and their villas **beautiful,** and **their** dresses magnificent, and their furniture costly, **if** their lives **were spent** in ignoble and enervating pleasures, **as** is **generally** admitted?"

II. In the following sentences name the part of speech and state the office of the words in black:

(a) I believe **him to be unprejudiced.**

(b) **Alice,** did you go **boating yesterday?**

(c) It cost **me** a **struggle** to **give** up the trip.

(d) They let **him stay.**

(e) "Ask **yourself** seriously **whether** you are **fit to read such** revelations **as** are **to follow."**

III. Discuss **fully** and **carefully** four of the following topics:

(a) The topic sentence and its development.

(b) The respective advantages of the long sentence, the periodic sentence, the balanced sentence.

(c) Unity in the paragraph.

(d) Coherence in the composition.

(e) Emphasis in the sentence.

IV. Write an essay of from 250 to 350 words on one of the following topics:

(a) A Reminiscence of My Childhood.

(b) Why I like ———. (a book, an eminent man, a place.)

(c) Describe a view from ———.

(d) All Students Should be Required to Take Athletics.

NOTE.—These essays are considered an important part of the examination. They will be graded mainly in diction, sentence structure and connection, and paragraphing. Good penmanship, neatness of manuscript, and correct spelling and punctuation are also important.

V. The examination in Literature will consist of two parts: first, over some of the books prescribed "For Reading;" and second, over some of those prescribed "For Study and Practice." (See pp. 40 and 41).

The first part of this examination is designed as a test of the student's ppreciation of the book as a whole, or of some prominent incident, charcter, or quality; also as a test of his ability to express himself in accorlance with the fundamental principles of discourse. Effective training or such an examination would be provided by writing concise paragraphs r well arranged essays on topics such as are suggested above.

The second part of the examination will call for evidence of more horough and systematic study. It may call for concise answers concernng allusions, figures of speech, qualities of style, and the interpretation f certain passages. It may also call for analysis or comparison or grouping of characters; also for plot, development in the work as a whole, or in some prominent part.

In both parts, knowledge of details, of minutiae of any sort, will be considered much less important than the ability to express thoughts, clearly, correctly, and in good order. In like manner the mere memory of details, of literary history or of opinions of critics, signifies much less than a genuine, independent appreciation of literature, the power to enter into the spirit of a book.

The following questions on *The Tale of Two Cities* suggests the sort of topics that may be anticipated on the books prescribed "For Reading:"

1. Are the titles of the "books" into which the story is divided, good ones? (1. Recalled to Life; 2. The Golden Thread; 3. The Track of a Storm). Tell why. Discuss one title fully, the others briefly.

2. Write a character sketch of one of the chief characters. (Not long, necessarily, but complete.)

3. Write a careful description of what you consider the greatest scene.

The following questions on *Macbeth* suggest what may be anticipated on the books prescribed "For Study and Practice."

1. Explain the structure of the play, giving the initial incident, the climax, and the catastrophe.
2. Explain the function of the first scene.
3. State briefly by whom and under what circumstances the following lines were spoken:
    a. "Had I but died an hour before this chance,
    I had lived a blessed time."
    b. "All the perfumes of Arabia will not sweeten this little hand."
    c. "Thy bones are marrowless, thy blood is cold;
    Thou hast no speculation in those eyes
    Which thou dost glare with."
4. What makes the sleep-walking scene so effective?
5. Explain the meaning of this passage, carefully step by step:
    "If it were done when 'tis done, then 'twere well
    It were done quickly; if the assassination could
    Trammel up the consequence; that but this blow
    Might be the be—all and the end—all here,
    But here on this shoal and bank of time,
    We'd jump the life to come."
6. Compare Macbeth and Banquo.

HISTORY.

EUROPEAN HISTORY.

1. Discuss (a) the significance of the Nile in the history of Egypt, and (b) the arts and industries of ancient Egypt, (c) Outline the work of a famous Egyptian king.

2. Give the date, important facts, and results of the Persian invasion of Greece in the reign of Darius.

3. The Athenian Empire: (a) trace its origin; (b) when was it at its height? (c) state the effect of the Peloponnesian war upon it.

4. Discuss the influence of the geographical features of Italy upon Roman history. Name the races of people in Italy at the dawn of the Italian history.

5. Outline the chief features of the Roman constitution in the reign of Augustus.

6. Feudalism: (a) its origin; (b) classes in feudal society; (c) feudal rights and obligations; (d) value of feudalism.

7. Give date, causes, and results of the Crusades.

8. Discuss the rise and growth of the Italian city republics.

9. Magna Charta: (a) circumstances under which it was secured; (b) chief provisions.

10. Reformation in Germany: (a) leading men; (b) principal steps in the movement.

11. Discuss fully the causes of the French revolution.

12. Something of importance concerning each of the following: Cardinal Wolsey, William the Silent, Cardinal Richelieu, Gustavus Adolphus, Charles Martel, Peter the Great, Oliver Cromwell, Lord Nelson, Bismarck.

AMERICAN HISTORY.

1. Sketch a map of the United States indicating (a) the boundaries at the close of the Revolutionary War and (b) each tract of land secured by treaty or purchase since the Revolution.

2. When and by whom was each of the following colonies first settled? New York, Virginia, Georgia, and Pennsylvania.

3. Tell something of importance concerning each of the following: Patrick Henry, William Loyd Garrison, Robert Fulton, William Penn, Robert Morris.

4. The United States Constitution: (a) By whom framed? (b) Why was such a new constitution needed? (c) When adopted? (d) What were some of most striking differences between it and the articles of Confederation? (e) When and in what respects has the Constitution been amended?

5. Enumerate the most important political parties which have arisen in the United States? State circumstances of the rise of each.

6. What were the most important facts concerning Jefferson's administration?

7. War of 1812: (a) Causes; (b) Important leaders; (c) Reults and significance.

8. Discuss the relation of Henry Clay to the Slavery Struggle.

9. The Southern Confederacy: (a) When established? (b) Its resident? (c) Why established? (d) How long did it last? (e) What states were included in it?

10. Write an essay of not more than 300 words on the American Indian.

ACADEMIC CLASSES.

For the accommodation of graduates from the smaller high schools of the state which offer only three years of work, and for other students who have had equivalent preparation elsewhere, this institution offers instruction in Academic classes in certain of the studies mentioned under (A) required credits, and also in certain elective credits. These subjects are here listed with a statement of the registered number of the course, the hours, and the semester in which the same are offered:

Course	Name of Subject	Hours Credit	Semester Taught	Leading to Course in
Botany 1	Elementary Botany	2	First	Agricultural
Civics 1	Government in State and Nation	2	First	Civil Engineering and Science
Civil Engineering 2	Field Work	1	First	Civil Engineering
Civil Engineering 1	Lettering	1	Second	Civil Engineering
English 1	Grammar	5	First and Second	For Academic Admission
English 2	Rhetoric and Composition	5	First and Second	All Four Year Courses
History 1	English History	5	First	For Academic Admission
History 2	Advanced American	4	First and Second	Science
History 16	National Period	3	First and Second	Agricultural and Engineering
Language 1	French	5	First	All Four Year Courses
Language 2	French	5	Second	All Four Year Courses
Language 5	German	5	First	All Four Year Courses
Language 6	German	5	Second	All Four Year Courses
Language 30	Spanish	5	First	All Four Year Courses
Language 31	Spanish	5	Second	All Four Year Courses
Literature 12	English Classics	4	Second	Agricultural and Engineering
Mathematics 1	Algebra	5	First and Second	For Academic Admission
Mathematics 2	Algebra	5	First	All Four Year Courses
Mathematics 3	Algebra Review	5	First and Second	All Four Year Courses
Mathematics 5	Plane Geometry	5	Second	All Four Year Courses
Mathematics 6	Solid Geometry	3	Second	Engineering
Mechanical Engineering 19	Freehand Drawing	1	First	Mechanical Engineering Electrical Engineering
Mechanical Engineering 29	Manual Training	1	Second	Mechanical Engineering Electrical Engineering
Mining Engineering 20	Elements of Mining	1	First	Mining Engineering
Mining Engineering 21	Elements of Mining	1	Second	Mining Engineering
Public Speaking 2	Declamation	2	First and Second	Agricultural

The Chairman of the Entrance Requirement Committee and the College Registrar shall have authority to determine the value of preparatory credits submitted, and notify applicants of assignment in course. Such assignments will be conditioned on the students doing creditable work.

Any student who at entrance presents satisfactory credit for part of the Academic course, or who by examination passes part of it satisfactorily, will be classified in such of the remaining work offered in the Academic year as the Dean of the Junior College and the Dean of the Division in which the student is enrolled shall consider will best prepare him for his college course. After providing in such classification for the remainder of the 30 credits required for entrance to college, the student may complete his schedule by taking up some of the Freshman studies.

Completion of the Academic work will not entitle the student to enter the Freshman class unless he presents the 30 semester credits regularly required for entrance, as already stated, not more than 7½ such credits being allowed for any year of the work of a secondary school. Inasmuch as the high school period is from forty-five to fifty minutes and the college period sixty minutes, the Academic course will be counted as 7½ credits.

Opportunity will be offered during the four weeks winter vacation whereby students deficient in Mathematics, English, or Modern Language, can take up some work in these lines under private tutors.

ENTERING IN JANUARY.

Students may enter the State College in the academic course, at the opening of the second semester, in January as advantageously as in the fall. Many students find it desirable to begin their studies in College in the second semester. Those who have had no considerable algebra in the preparatory school should review its fundamental principles and become acquainted with its application in the wider and more difficult field of college work, and those who have had experience in plane geometry can, to advantage, supplement such study by a review of some standard text and a thorough drill in original geometric propositions. The classes established at the beginning of the spring semester furnish an excellent opportunity for students to prepare themselves thoroughly for entering upon collegiate work at the opening of the next college year.

SPECIAL STUDENTS.

Students taking special work in any of the college courses must be at least twenty years of age, must give good and satisfactory reason for desiring such classification and must furnish satisfactory evidence that they are thoroughly prepared to pursue the work chosen. Permission to take such special course and the subjects included therein must receive the approval of the President of the College and the Dean or Head of the Department in which the student seeks enrollment.

Special students when not qualified to enter above the Freshman ear, will be required to take the first year of their work from Junior ollege studies.* During the second year they may be admitted to the enior College studies in accordance with the rules governing admission o each study or course.**

Special students are subject to the same rules governing conditions n back work that apply to all other students. Students wishing to hange from a regular to a special course either in the same or another epartment will be required to remove conditions on back work. Special tudents, as well as regular students, are subject to the conditions given nder "Entrance."

It is the theory of special classification that students should be articularly strong and well prepared to do thorough work in the studies hey elect. A high standard of scholarship will, therefore, be required f all who are thus classified.

*Special Interpretation for Agricultural Students.—An exception o this rule will be made in case of Animal Husbandry 11 and 12, which may be taken the first year in lieu of Animal Husbandry 2 and 3, which cannot be taken until the work in Animal Husbandry 1 and 2 has been completed.

**For conditions of admission to any course, see the description of he course of study.

FEES AND EXPENSES.

The entire expenses of a student need not exceed $250.00 per College year.

Tuition.—No charge for tuition is made to the students from the tate of Iowa. To the non-residents, a tuition fee of $50.00 per year is harged.

Janitor Fee.—The regular janitor and incidental fee for the semester is $10.00, but all students who classify during the classification period, Thursday, Friday and Saturday before College work begins, will be charged a janitor fee of only $8.00 per semester.

Laboratory Fees.—Laboratory fees at the actual cost of breakage and usage are charged to the students, the Treasurer's receipt for such fee being required before the students are admitted to laboratories. For the amount of such fees see the department courses.

Board and Room.—About one hundred young women can secure rooms in Margaret Hall. The privilege of rooming in this building is reserved for regular students. Students rooming in this building furnish their own bedding and all furniture except bedsteads, dressers, and tables. Each girl pays $5.00 per semester for room and a sum not exceeding 55 cents per week for lighting, heating and incidentals.

All other students can secure furnished rooms and board in clubs or private families adjacent to the College grounds at from $3.50 to $4.50 per week.

The College Custodian, office in old office building, should be consulted by all new students concerning rooms and rooming places, that undesirable rooms and houses may be avoided. The College authorities reserve the right to forbid students rooming in any particular house for sanitary or any other reasons.

No group of young women students may establish a "house" or "home" without the full knowledge and approval of the President and the Dean of Women, nor make any definite plans in such direction. No young woman may become a resident of a sorority house until after she is an initiated member of the sorority.

Hospital Fee.—All students living in College buildings and such others as desire to, pay a Hospital fee of $2.50 per semester. (See College Hospital.)

Diploma Fee.—A diploma fee of $5.00 is payable before graduation.

Text Books.—All text books and stationery may be purchased at the College Book Store at about twenty per cent below the average retail price.

As security for the payment of bills, all students living in College buildings are required to deposit $10.00 with the Treasurer, which deposit will be returned at the final settlement at the close of the semester. All the bills for each month must be settled at the Treasurer's office by the second Saturday of the next month.

ENTRANCE.

The office will be open for registration at 8:00 A. M. on the Thursday preceding the opening of each semester. All students are required to register as soon as possible.

Students who are required to take the entrance examinations will be examined here the Tuesday and Wednesday preceding classification days. After passing the examinations, the examination card should be taken to the classifying committee who give a card of classification which admits to college and assigns to class work. The student's name is at once entered upon the official list and will be included in the roll call of the following day. Attendance is expected thereafter at every recitation of the semester.

CLASSIFICATION AND STANDINGS.

The amount of work in each course is expressed in hours, *an hour* meaning one recitation or its equivalent per week throughout the semester. It is considered that one hour's recitation or lecture will require as much time in the preparation, and hence is equivalent and receives an equal credit with a three hour laboratory.

Number of Hours.—No student shall be allowed to classify in ore hours than are specified in the catalogue for the semester of the ourse taken unless he has an exceptionally high record in his previous ollege work. The taking of such additional work is subject to the pproval by the Dean under whom the student is classified and the Head f the Departments in which the student is classified.

In general, students failing in any portion of a term's work will not e allowed to take full classification for the next semester.

Classification.—No student shall be admitted to or dropped from ny class except by authority of the Classifying officer.

Standings.—All the standings are based on the scale of 100. The assing grade is 75. A student receiving between 60 and 74 per cent nclusive in any course is conditioned and allowed to make up the condition under the direction of the head of the department. A student receiving below 60 per cent in any course is not passed in that course.

Back Studies.—Students shall be classified in back studies in all cases in which such studies are taught, subject to the first rule under Numbers of Hours. Any exception to this rule must be for good and sufficient reason approved by the President of the College and the Dean or Head of the Department in which the student is enrolled.

No student shall be considered a candidate for graduation who has not at the beginning of the second semester of the Senior year completed his work to within the maximum number of hours regularly allowed in his course for that semester. If the uncompleted work is not offered in the second semester it shall be passed and reported to the recorder not later than April 1st.

EXAMINATIONS.

Examinations for back work for matriculated students will be conducted at the opening of each semester, on the Tuesday and Wednesday preceding classification days.

TUESDAY.

8-10 A. M.	—Farm Crops	Farm Crops Lecture Room, Ag. Hall
8-10 A. M.	—Mining Engineering	Room 306, Engineering Hall
8-10 A. M.	—Zoology	Zoological Lecture Room
10-12 A. M.	—English	Rooms 1 and 3, Central Building
10-12 A. M.	—Civil Engineering	Room 312, Engineering Hall
1- 3 P. M.	—Mech. Engineering	Rooms 204 and 205, Eng. Hall
2- 4 P. M.	—History	Room 208, Central Building
3- 5 P. M.	—Public Speaking	Room 308, Central Building
3- 5 P. M.	—Electrical Engineering	Eng. Hall, Room 207

WEDNESDAY.

8-10 A. M.	—Horticulture	Hort. Lecture Room, Agr. Hall
8-10 A. M.	—Chemistry	Chemical Hall, Room 29
8-10 A. M.	—Mathematics	Room 221, Central Building
8-10 A. M.	—Animal Husbandry	An. H. Lecture Room, Agr. Hall
10-12 A. M.	—Economics	Room 222, Central Building

10-12 A. M.—Dairying....................................Dairy Building
10-12 A. M.—Botany........................Room 312, Central Building
1- 3 P. M.—Civics..........................Room 102, Central Building
1- 3 P. M.—Mech. Engineering..........Rooms 204 and 205, Eng. Hall
1- 3 P. M.—Domestic Economy....................History of Art Room
2- 4 P. M.—Modern Language.............Room 119, Central Building
2- 4 P. M.—Agricultural Eng.....Agr. Eng. Lecture Room, Agr. Hall
3- 5 P. M.—Soils........................Soils Lecture Room, Agr. Hall
3- 5 P. M.—Physics...................................Room 207, Eng. Hall

Conflicts.—Students shall not classify in conflicting studies without the approval of the Classifying officer and Heads of the Departments in which the student wishes to enroll.

Junior and Senior College.—The students are now classified in "Junior and Senior Colleges." The Junior College is composed of all students in the Academic, Freshman and Sophomore years: the Senior College, of all in the Junior and Senior years.

DEPARTMENTS MAINTAINED.

Agricultural Engineering,
Agricultural Chemistry,
Agronomy,
Animal Husbandry,
Botany and General Bacteriology,
Chemistry, General and Applied,
Civics,
Civil Engineering,
Dairying,
Domestic Economy,
Economic Science
Electrical Engineering,
English,
Farm Crops,
Forestry,
Geology,
History,
Horticulture,
Literature and Rhetoric,
Mathematics,
Mechanical Engineering,
Military Science,
Mining Engineering,
Music,
Modern Languages,
Physics,
Psychology and Ethics,
Public Speaking,
Science and Agriculture,
Soils,
Veterinary Science,
Zoology.

GOVERNMENT.

The relations of our College buildings, and the nature of the exercises, complicated as they are, by laboratory work, shop practice and labor, make order, punctuality and systematic effort indispensible. The institution, therefore, offers no inducement to the idler or the self-indulgent. All who are too independent to submit to needful authority, too reckless to accept wholesome restraint or too careless to take advantage of their opportunities, are not advised to come. The discipline of the College is confined mainly to sending away those who prove, on fair trial, to be of this class.

MANUAL LABOR.

The following regulations in regard to manual labor have been lopted by the Board of Trustees:

1. The manual labor of students is divided into two kinds, viz: ninstructive labor, which shall be paid for in money, and instructive bor, which shall be compensated by the instruction given and the skill cquired.

2. Uninstructive labor shall comprise all the operations in the orkshop, the garden, upon the farm and elsewhere, in which the work one accrues to the benefit of the College, and not to that of the student. nstructive labor shall embrace all those operations in the workshop, useum, laboratories, veterinary hospital, experimental kitchen, upon the arm, garden and experimental stations, in which the sole purpose is the cquisition of knowledge and skill.

3. Students shall engage in instructive labor in the presence and nder the instruction of the professor in charge according to the statement made in each of the courses of study.

The compensated labor furnished by the Divisions of Agriculture, Veterinary Medicine and of Engineering, is given by each to its own tudents and is eagerly sought. The "details" of compensated labor upplied by the needs of the various departments are given to the most aithful and meritorious students in each department. Uninstructive abor is paid for according to its value to the College, but no student hould expect to pay the main part of his expenses by labor while here. The College cannot furnish the work, and even if it could, the student's ime is *chiefly needed for study*. Still, many worthy and industrious stulents pay a considerable part of their expenses by labor, over $4,000 being aid out by the College thus each year to students and post-graduate ssistants.

GRADUATING THESIS.

All candidates for graduation in the Engineering and Agricultural ourses are expected to present a satisfactory thesis.

The subjects for theses shall be selected under the direction of the rofessor in whose department they are written, and submitted to the Thesis Committee, with signed approval of the professor, on or before he first Monday in October.

It is expected that each thesis shall represent an amount of work quivalent to at least one exercise per week through the Senior year; hat it shall show the result of the student's personal study or investigation and be throughout original in matter and treatment so far as he nature of the subject will permit; that it shall be prepared under he supervision of the professor in charge, the student making frequent eports of progress and having an outline of matter ready for approval y the first week of the last semester.

The complete thesis shall be submitted to the Thesis Committee on or efore May 25th.

POST GRADUATE COURSES.

The faculty of this College offers the degree of Master of Scientific Agriculture (M. S. A.) to Bachelors of Scientific Agriculture who are graduates of this College or others offering equivalent courses of study, the degree of Master of Science (M. S.) to Bachelors of Science who are graduates of this College or other colleges offering equivalent courses of study, the degree of Master of Agricultural Engineering (M. A. E.) to Bachelors of Agricultural Engineering who are graduates of this college or other colleges offering equivalent courses of study, and also Professional degrees in Engineering.

MASTER'S DEGREE.

The opportunity for resident study after graduation is a privilege granted only upon the recommendation of the President with the advice and consent of the Committee on Post-Graduate Study and the professors in charge of the departments in which the studies are to be pursued.

The candidate shall spend at least one academic year in residence. If only one year is spent in residence, the candidate shall devote his entire time to his post-graduate studies, except in cases where work previously done *in absentia* is accepted at the beginning of the students' residence by the Professor in charge of the major subject; such *in absentia* work shall constitute not more than one-half of the required work. In the case of graduates of this college, temporary leave of absence may be granted during the year's residence for special study elsewhere. In order to be entitled to his degree, the candidate must meet within four years the requirements existing at the time of matriculation, otherwise he must complete any additional requirements which may be in force at the time of his final examination.

Two lines of work shall be selected, designated as major and minor studies, the former to be given two-thirds and the latter one-third of the time. The major study shall be research work, the results of which shall be incorporated in a thesis.

The major and minor studies shall be so selected as to support and strengthen each other.

No under-graduate study shall be selected as a major study. Under-graduate studies may be taken for part of the minor work only with the approval of the Committee on Post-Graduate Study, and the heads of the departments in which the work is to be done.

The candidate shall have a reading knowledge of French or German.

Application for graduate study, specifying the departments in which the major and minor subjects are to be taken, shall be filed with the President within four weeks of the beginning of the first term's resident work, which, in all cases, shall be not later than October 1st, next preceding the commencement at which the degree is to be granted.

A detailed outline of the work to be done in the major and minor subjects approved by the heads of the departments in which the work is to be taken shall be filed with the Committee on Post-Graduate Study, within eight weeks of the opening of the semester in which resident work is begun.

The candidate for the master's degree shall apply in writing for examinations not later than May 1st, and such examinations shall be given not later than May 15th.

Graduates of other institutions desiring to become candidates for post-graduate degrees in this institution shall be required to show to the Committee on Post-Graduate Study evidence of under-graduate work equivalent to the corresponding course in this institution, and if any deficiency appears in the subjects elected for post-graduate work, to make up such deficiency.

Candidates for advanced degrees are expected to appear on the Commencement stage to receive such degrees.

PROFESSIONAL DEGREES IN ENGINEERING.

The several departments of the Division of Engineering confer the following professional degrees: In Mechanical Engineering, the degree of Mechanical Engineer, (M. E.); in Civil Engineering, the degree of Civil Engineer, (C. E.); In Electrical Engineering, the degree of Electrical Engineer, (E. E.); In Mining Engineering, the degree of Mining Engineer, (E. M.).

Applications for professional engineering degrees will be received from graduates of the engineering departments of this College or from other colleges offering equivalent courses of study in engineering.

To be entitled to the professional degree, the applicant therefor shall have devoted not less than one year to resident study along lines satisfactory to the engineering faculty, shall have been engaged for not less than one year in a responsible professional position, and shall present a satisfactory thesis, or he shall have been engaged for not less than five years in a responsible professional position and shall present a satisfactory thesis.

In this connection a responsible professional position means practical engineering experience, requiring the exercise of skill or executive ability in designing or construction work. References or personal knowledge of the facts will be required by the engineering faculty.

Further information as to the lines of work open to graduate students can be found under the courses of study described elsewhere.

COLLEGE HOSPITAL.

The actual sanitary condition of the College is excellent. The buildings are situated on high ground with good natural drainage. The water supply is exceptionally pure and abundant. The sewer system and sewerage disposal plant are the best that modern sanitary engineering can devise. Nevertheless in this, as in other like institutions, whos students are drawn from a wide territory, various diseases are brough here by the students themselves. In order to control epidemics an properly care for other cases of illness or injury, two hospitals are provided. These hospitals are under the charge of the College Physician assisted by a professional nurse, a competent house-keeper, and a student hospital steward.

The expenses of the hospitals are defrayed from a fund accruin from the hospital fees paid by students.

A hospital fee of $2.50 per semester is required of all students livin in College buildings.

The privileges of the hospitals are also extended to students no rooming in the College buildings, provided, 1st, that the physician shal be paid for calls at their residences, and 2nd, that the usual hospital fe shall be paid within the first ten days of the student's arrival.

Students not making the hospital deposit will be admitted to th hospital upon the basis of $10.00 per week, within the discretion of th college physician.

The hospital fee insures to the payer thereof, medical attendance nursing and medicine in illness or accident, and consultation and medicin for minor ailments in accordance with the regulations herein published

The charges named are based upon the probable actual cost of medical attendance and hospital service, and the fund created is carefull devoted to these purposes. The College can not assume any liabilit beyond the extent of the fund so created. The hospital has proved to b a great blessing to the students.

The following regulations apply to the privileges of the hospital:

1st. Students entering the hospital shall be charged $3.00 per weel for board, room, light and heat. But for any time in excess of thre consecutive weeks per term spent in the hospital an additional charg above that mentioned shall be made of $4.00 per week.

2nd. In case a special nurse or physician is employed, the expens shall be borne by the particular patient, the selection of such nurse o physician to be approved by the College physician.

3rd. The College assumes no responsibility whatever nor shall th privileges of the hospital be extended to cases of smallpox.

4th. The President and College physician may require of student entering the college a certificate of a reputable physician showing successful vaccination.

5th. The College physician is authorized to exclude from the College dormitories and recitation rooms any person afflicted with a contagious disease.

COLLEGE LIBRARY.

The College Library, consisting of over 23,400 volumes and abou 6,000 pamphlets, is chiefly a library of reference, containing standar and technical works bearing particularly upon the lines of study pursued in the College. Magazines, periodical literature bearing upon the special work of the students, and daily papers are furnished for the use of the students. The reading room of the library is open thirteen hours daily except Sunday, when it is open four hours. Personal assistance will be given by the librarian and assistant to any who desire help in reference work.

This year the College received by bequest about 1500 volumes pertaining to Engineering and Economics from the library of the late Geo. W. Catt. This Engineering Library with that section of books from the general collection has been made a Departmental Library located in Engineering Hall.

RELIGIOUS LIFE AT THE COLLEGE.

Although a state school, and hence non-sectarian, the College life is dominated by religious influences.

The Young Men's and Young Women's Christian Associations, Bible Study Classes, and Mission Classes, consisting of members from both faculty and student body have a helpful influence not only upon the religious but upon the social life of the College. The members of the Associations assist in the reception of the new students and in the maintenance of religious work.

The work of each Association is under the direction of a general secretary. These two Associations are now located in their new home, "Alumni Hall," which was constructed at an expense of $60,000.00 by funds donated by the Alumni, students, instructors, citizens and friends. This home is the center of the religious and social life of the College and as a building for such purposes it is not excelled in the West.

The faculty and students assemble daily in the Chapel at 9:40 A. M. for public worship. On each Sunday morning at 10:45, Chapel exercises are conducted by some prominent clergyman invited for the occasion. In all these services, the object is to emphasize and enforce the principles of morality and of the Christian religion.

There are nine different denominational churches in Ames, all of which are closely in touch with and cordially invite the students to coöperate with them in all of their religious services.

ALUMNI ASSOCIATION.

The Alumni Association of the Iowa State College was organized in 1876. Its purpose is to promote the highest interest of the institution and to increase the friendship and sympathy among the students and alumni.

The present officers of the association are: E. W. Stanton, '72, Honorary President; R. B. Swift, '90, President; Mrs. Olive W. Curtiss, '87, Secretary; L. C. Tilden, '88, Treasurer; and Mrs. Mary McDonald

Knapp, '83, Historian. The annual business meeting and banquet are held on Wednesday and Thursday of Commencement Week. A local association was organized in April, 1903, in order to arrange for the annual meetings and to keep the alumni in close touch with one another Branch associations have been organized in Des Moines, Washington D. C., New York, Pittsburg, Chicago, Philadelphia, Schenectady and St. Louis.

The Alumni Hall adds much to the association, as it affords a place where all alumni can meet when visiting their Alma Mater.

COLLEGE PUBLICATIONS.

1. Catalogue, published in February, and giving general information about the College and its several departments.
2. College Compendium, an illustrated catalogue of the school.
3. Special announcements of the Agricultural, Veterinary and Engineering divisions, and of the Short Course and Good Roads School, one bulletin being published each month.
4. Bulletins recording the results of experimental studies carried on by the Agricultural and Engineering Experiment Stations.
5. Iowa Engineer, published bi-monthly by the Engineering Department of the College.
6. The Alumnus, a monthly publication, devoted to and published by the Alumni Association.

STUDENT PUBLICATIONS.

1. The Student, a weekly paper, published by a staff elected from the student body and devoted to the recording of such matters as pertain to the interest and welfare of the school.
2. The Bomb, an annual published by the Junior Class.
3. Iowa Agriculturist, published monthly by the Agricultural Club of the Iowa State College.

LITERARY SOCIETIES.

The work of the nine literary societies serves not only to supplement the social and literary work of the College, but also aids the student in securing that training so necessary to enable one to appear before an audience, the training which every student needs and which cannot be secured in the class room alone. It is the purpose of the officers of the College to keep each Friday evening open that the work of these societies may go on without interruption. Every student is invited and urged to join one of these societies.

DEBATING LEAGUE.

The Debating League is an organization composed of the Bachelor, Crescent, Phileleutheroi, Philomathian, Pythian, Welch and Forum liter-ry societies. Its function is to arrange for and carry out debates, both nter-society and inter-collegiate. There is an inter-society debate each emester, calling out four students from each society. Of these four students, two maintain the affirmative and two the negative, of the same proposition on the same night against opposing teams from other societies. During the year the inter-society contests give opportunity for forty-eight students to engage in vigorous debate and many others get practice n trying to win a place on their society teams. During the fall semester a debate is held with the Iowa State Normal School. Hereafter we will support a dual debate, thus calling out six debaters from each school. The triangular inter-collegiate debate with Drake University and Iowa College held during the spring semester also calls for six students to represent the Iowa State College. The debates arouse great interest, and to the participants, they bring great profit.

ORATORICAL ASSOCIATION.

The Oratorical Association is composed of three members from each of the literary societies and three from the faculty. This association, by providing for joint public programs, declamatory and oratorical contests, and society graduation, helps to increase the interest in the general literary work of the school.

Inter-society oratorical contests are held each fall semester and declamatory contests each spring semester, each society having one representative. The winner in the inter-society oratorical contest represents the College in the annual inter-collegiate contest in which Drake, Penn, Parsons, Upper Iowa University, Cornell, Des Moines, Coe, Lenox, Leander Clark, Tabor, Central University, Buena Vista College and Iowa State College are represented.

MUSICAL ORGANIZATIONS.

The College maintains a Choral Society, membership being open to students and citizens of Ames, a College Choir, a Male Glee Club, and a Ladies Glee Club, all of which give frequent concerts and recitals. The musical organizations are under the supervision of the Director of Music.

A College Band of thirty-two pieces is maintained under the instruction of Charles L. Mundhenk, a member of the Iowa State Band of 1893. This band furnishes music in connection with the Military Department and also for all athletic and student assemblies.

DIVISION OF AGRICULTURE

DIVISION OF AGRICULTURE

CHARLES F. CURTISS, DEAN.

SPENCER A. BEACH, VICE DEAN.

The division of Agriculture offers to its students work in any of the following courses:

Course in Agronomy.
Course in Dairying.
Course in Animal Husbandry.
Course in Horticulture.
Course in Science and Agriculture.

These courses are so arranged as to furnish a good foundation from which a student may become either a successful farmer or may develop into a specialist in one of the many branches of the Agricultural industry. The department offers short as well as the regular four year courses, the difference being due largely to the degree in which the student wishes to specialize in any line of work. The farm as it is usually conducted is a union of many divisions of industry, and the shorter course confines itself to laying a foundation that will secure success in all of these; while the longer course seeks to direct the student into that line which will call forth and centralize his special ability and at the same time enable him to meet the variety of conditions that under all circumstances surround a successful life.

Past experience with these courses shows that they have met with more than the usual success in attaining their objects; as the shorter course has been productive of many successful farmers, and the longer course has been unusually successful in developing better farmers and more capable men in practical life and also in securing for our graduates prominent positions in the agricultural faculties of other colleges.

In the courses in practical agriculture, a field of work which is unsurpassed by any other college in the United States is open to our students. The national government gives to the college about thirty-five thousand dollars annually for original experimentation and instruction in agriculture and the sciences related to this industry. This supplemented by liberal state aid, enables the College authorities to make the fields and the barns veritable laboratories of extensive and most practical investigation and observation. The range is from the soil which produces, through all of its natural characteristics to whatever is grown in agriculture from germ to finish.

The farm consisting of 1200 acres of rolling prairies, bottom and woodland is stocked with good representatives of six breeds of horses, ven breeds of cattle, seven breeds of sheep and six breeds of hogs. hese animals are used in class illustration and for the various experi- ents in breeding and feeding for milk, meat, wool, growth and main- nance, conducted by the Experiment Station as a department of the ollege. All the crops are grown for some educational purpose; all the nimals are fed by rule and system, and the result of their management ported upon and used in class work.

Two commodious, well-lighted stock judging pavilions have recently een constructed, into which live animals are brought in the presence of e teacher and the class for careful study and intimate knowledge. An xperimental barn with the recent and most approved methods of stalls, eeding and ventilation, is devoted exclusively to the original work of nimal husbandry and agronomy, the work ranging over all the questions f breeding and maturing domestic animals.

The work of this department is designed to teach the sciences that nderlie practical agriculture, and sufficient English, literature, mathe- atics, history, and other supplementary studies to sustain both scientific nd practical agriculture and to develop the agricultural students to the vel of the educated in any profession. Special attention is given to he improved methods in all of the various operations of farming, farm uilding, use of tools and machinery, and management of all kinds of tock and crops. The instruction embraces not only the principles but lso the practices of agriculture.

AGRICULTURAL COURSES

All Students classified in the Agricultural Courses will take the ame work until the beginning of the Sophomore year, when the se- ction of the desired course will be made by the student.

Academic Year

The Academic studies will not be required except so much as may e necessary to make up the thirty required and elective credits for admis- ion to the Freshman Year. See index for Admission to the College.

FIRST SEMESTER.

		Required Semester Hours
athematics 3,	Algebra Review	5
nglish 2,	Rhetoric and Composition	5
odern Language—		
The Language selected will be continued through the Academic Year.		
Language 1, Language 5, Language 30,	French 5 German 5 Spanish 5	5

Botany 1,	Elementary Botany	2
Public Speaking 2,	The Declamation	1
	Total Semester Hours	18

SECOND SEMESTER.

		Required Semester Hour
Mathematics 5,	Plane Geometry	5
Literature 12,	English Classics	4
Modern Language—		

The Language selected must be a continuation of the one chosen at the beginning of the Academic Year.

Choice Language 2,	French 5	5
Choice Language 6,	German 5	
Choice Language 31,	Spanish 5	
History 16,	The National Period	3
	Total Semester Hours	17

**Freshman Year

FIRST SEMESTER.

		Required Semester Hour
*Agricultural Engineering 1 or 2,	Shop Work	2
Animal Husbandry 1,	Market Types of Cattle and Sheep	2
Farm Crops 1,	Corn Growing and Judging	3
Horticulture 14,	Farm Forestry	3
Veterinary 55,	Anatomy of Domestic Animals	2
English 10,	Narration and Description	3
Mathematics 17,	Algebra and Trigonometry	3
History 19,	The Making of the Nation 1783-1817	2
Military 1,	Military Drill	..
Library 1,	Library instruction (4 hours during the semester)	
	Total semester hours	20

**Freshmen who show deficient preparation in English or Mathematics may assigned by the Dean of the Junior College and the Dean of Agriculture, to spec classes, with one credit hour more work than indicated above, or in case of clear in cation of failure, even with this arrangement, they may be assigned to Academ classes.

SECOND SEMESTER.

		Required Semester Hours
gricultural Engineering 1 or 2,	Shop Work	2
nimal Husbandry 2,	Market Types of Dairy Cattle, Horses and Swine	2
airying 12,	Farm Dairying	3
arm Crops 2,	Grains, Grasses and Forage Crops	3
orticulture 2,	Plant Propagation	3
nglish 11,	Exposition	3
hysics 205,	Mechanics, Heat and Light	3
ilitary 2,	Military Drill	..
	Total semester hours	19

DEPARTMENT OF AGRONOMY

Agronomy is the science of the Field and its crops. It treats of arm Management, the application of economic business methods to arm practices; Field Crops, their classification, production and imrovement; Soils, their fertility, cultivation and improvement; and gricultural Engineering, the tools, machinery, fences and drains of he farm. The Department of Agronomy consists of the three co-rdinate Departments, Farm Crops, Agricultural Engineering and Soils.

COURSE IN AGRONOMY

For Freshman year, see Agricultural Courses, page 65. All agriultural students will take the same work until the beginning of the ophomore Year.

Sophomore Year.

FIRST SEMESTER.

		Required Semester Hours
gricultural Engineering 4,	Farm Engineering	4
arm Crops 3,	Corn Breeding and Judging	2
nimal Husbandry 3,	Breed Types of Cattle and Sheep	4
orticulture 3,	Orcharding	3
gricultural Chemistry 21,	Elementary Experimental Chemistry	5
nglish 12,	Argumentation	2
ilitary 3, or Athletics		..
	Total semester hours	20

SECOND SEMESTER.

		Required Semester Hours
Agricultural Engineering 5,	Farm Machinery and Farm Motors	3
Farm Crops 4,	Grain Breeding and Judging	2
Animal Husbandry 4,	Breed Types of Dairy Cattle, Horses and Swine	4
Zoology 16,	General Zoology	5
Agricultural Chemistry 23,	Elementary Experimental Chemistry	5
Military 4, or Athletics		..
	Total semester hours	19

Junior Year.

FIRST SEMESTER.

			Required Semester Hours	
	Soils 1,	Soil Physics	5	5
	Agricultural Chemistry 25,	Agricultural Analysis	4	4
	Animal Husbandry 21,	Principles of Breeding	2	2
Choice	Zoology 4,	Entomology 4	4 or	5
	Mathematics 8,	Analytical Geometry 5		

Students who elect Mathematics 8 will be required to take Mathematics 9 and Physics 404.

Economic Science 9,	Outlines of Economics	3	3
		18 or	19

Elective

The Student will select from the list of electives on page 111 enough work to make a total of from 18 to 20 hours per week.	0 to	2
Total semester hours	18 to	20

SECOND SEMESTER.

			Required Semester Hours	
	Soils 2,	Soil Fertility	5	5
Choice	Farm Crops 9,	Research Work 3	3	3
	Agricultural Engineering 9,	Research Work 3		
	Soils 3,	Research Work 3		
	Botany 40,	General Bacteriology	2	2

Choice	Botany 11,	Vegetable Physiology 4	4 or 5
	Mathematics 9,	Calculus 5	

Students who elect Mathematics 8 in first semester Junior must elect Mathematics 9.

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14	15

Elective

The Student will select from the list of electives on page 111 enough work to make a total of from 16 to 20 hours per week. 2 to 6

	— —
Total semester hours	16 to 20

Senior Year.

FIRST SEMESTER.

			Required Semester Hours
	Farm Crops 8,	Farm Management	3
Choice	Soils 4,	Research Work 3	3
	Agricultural Engineering 10,	Research Work 3	
	Farm Crops 9,	Research Work 3	
	Animal Husbandry 9,	Animal Nutrition and Packing House By-Products	2
	Botany 5,	Vegetable Pathology	3
			—
			11

Elective

The Student will select from the list of electives on page 111 enough work to make a total of from 16 to 20 hours per week. 5 to 9

	— —
Total semester hours	16 to 20

SECOND SEMESTER.

			Required Semester Hours
Choice	Agricultural Engineering 11,	Thesis 3	3 or 5
	Agricultural Engineering 12,	Thesis 5	
	Farm Crops 15,	Thesis 3	
	Farm Crops 16,	Thesis 5	
	Soils 11,	Thesis 3	
	Soils 12,	Thesis 5	

Choice	Horticulture 4, and	Plant Breeding	3	4 or 5
	Botany 24,	Embryogeny	1	
	Physics 404,	Electricity, Magnetism, Light and Sound	5	

Students who elect Mathematics 8 and 9 will take Physics 404.

7 to 10

Elective

The Student will select from the list of electives on page 111 enough work to make a total of from 16 to 20 hours per week. 9 to 13

Total semester hours 16 to 20

FARM CROPS DEPARTMENT.

M. L. BOWMAN, ASSOCIATE PROFESSOR IN CHARGE OF DEPARTMENT.
H. G. BELL, INSTRUCTOR IN FARM CROPS.
B. W. CROSSLEY, INSTRUCTOR IN FARM CROPS.
M. L. MOSHER, EXTENSION WORK.
JAMES A. KING, EXTENSION WORK.

The new equipment installed in the Farm Crops Department enables it to give most efficient work in all of its courses. There has been installed a new chemical laboratory which is for the special use of advanced students and post graduate students which offers special inducement to students desiring to fit themselves for college or experimental work.

The grain laboratory situated on the second floor of the stock and grain judging pavilion has been supplied with the most modern equipment, making it the best and most completely equipped laboratory of its kind.

The demand for competent men trained along farm crops lines is rapidly increasing. Farm managers are especially needed to fill positions on both large and medium sized tracts of land, at good salaries. Likewise men well trained along the line of farm crops are constantly in demand by large seed establishments and by the agricultural press. It is the purpose of the Farm Crops Department to help students fit themselves along these practical lines. The following courses are offered:

WINTER COURSES IN CORN AND GRAIN JUDGING.

January 4, 1909 to January 16, 1909.

A short course in corn and grain judging has been established in order to meet the demand for instruction in this work. This course begins January 4, 1909, and continues two weeks.

Instruction will be given in the methods of selecting, testing, and preparing seed for planting; in the methods of cultivation; and the characteristics and adaptability of different varieties of corn to various sections of the state. A comparison of corn cultivators, and of planter tests with both rotary and edge-drop planters will be made.

This course is especially planned for the farmer who cannot take advantage of the work of the regular College course. Those wishing to become corn judges qualified to judge corn at farmers' institutes, fairs, and expositions will have an opportunity at this corn school to fit themselves for this work.

Samples of all the leading varieties of corn grown in Iowa will be on exhibition and will be used for judging purposes. A fire proof two-story stock and grain judging pavilion has been erected for this work. An examination will be held at the close of the school, and corn judging certificates will be issued, by the Iowa Corn Growers' Association, to those who prove themselves proficient.

The equipment of the Grain Judging Pavilion, which has been installed at a cost of $3,000, offers excellent facilities for small grain judging. The study of commercial grading of wheat, oats, barley and rye is also given careful attention. This work is taken up on a basis that is very similar to the grading practiced in the Chicago markets.

To partially cover the expense of additional instructors and facilities for judging, a tuition fee of $3.00 to residents and $5.00 to non-residents will be charged, the one fee covering the instruction in either grain and stock judging, or in grain judging and horticulture. The work during the course will be so arranged that the students' time will be equally divided between either grain and stock judging, or grain judging and horticulture.

METEOROLOGY AND CLIMATOLOGY.

The object of the course is to give the student a knowledge of the fundamental principles which govern weather and climate. The first half of the term is devoted to a study of the elementary principles of meteorology. The student is acquainted with the instruments used by the weather bureau, the principles upon which they are based, and their care and uses are explained. The last half of the term is given to a consideration of the fundamental principles which control weather and climate. Throughout the entire course the charts and maps issued by the state and federal weather bureaus are used freely. The student is given practice on the construction and interpretation of charts and in forecasting. See write-up under Geology.

COURSES IN FARM CROPS.

1. **Corn Growing and Judging.** Required first semester Freshman in all Agricultural courses. Includes study of methods of selecting,

testing, grading, planting, cultivating, harvesting and storing of corn, corn judging, commercial handling of corn, cost of production and uses of crop, the different conditions affecting the stand and quality of crop as studied in class room and under field conditions. Study is made of the different types of corn, including the kernels, ears and groups of ears, together with practice in selecting, germinating and grading corn and in calibrating the planter. Three hours credit. Recitations, two hours, and laboratory, two hours per week. Fee, $1.50.

2. **Small Grains, Grasses, and Forage Crops.** Required second semester Freshman in all Agricultural courses. Includes study of grains and other field crops; their adaptation to soil and climate, conditions affecting growth, methods of culture, principles underlying reproduction, germination, plant growth and improvement; also score card practice in small grains. Three hours credit. Recitations, two hours and laboratory, two hours per week. Fee, $1.50.

3. **Corn Breeding and Judging.** Required first semester Sophomore in Agronomy course and elective Junior or Senior year in all other agricultural courses. Includes a detailed study of all the leading varieties of corn, their origin, history and adaptation to the different localities. Also a careful study of the best methods to be employed in the improvement of corn by selection and breeding. Corn judging will be a special feature of the work. The distinguishing characteristics of the different varieties of corn will be given careful attention. Two hours credit. Laboratory and lectures, four hours per week. Fee, $2.00.

4. **Grain Breeding and Judging.** Required second semester Sophomore in the Agronomy course and elective Junior or Senior year in all other agricultural courses. Includes a detailed study of all the leading varieties of small grains, their origin, history and adaptation to the different localities, also a careful study of the best methods to be employed in their improvement. Grain judging will be one of the chief features of the work, together with a study of the weed seeds found in the commercial grades of these grains. The distinguishing characteristics of the different varieties will be studied, also the uses to which the small grains are put. Two hours credit. Laboratory and lectures, four hours per week. Fee, $2.00.

8. **Farm Management.** Required first semester Senior year in Agronomy, elective first semester Junior or Senior year in all other agricultural courses. This course includes the study of the different systems of extensive and mixed farming, problems confronting the farmer, circumstances influencing agricultural practices, the hired help, fencing, live stock and a study of the methods pursued by our most successful farmers. A practical and thorough study of farm accounts is made a special feature. The extensive coöperation which the Farm Crops Department is having along the line of farm management with a large number of the best farmers of the state helps

to make this a most practical course in systematizing the general farm practices. Three hours credit. Fee, $2.00.

9. **Research Work in Farm Crops.** Required second semester Junior, or first semester Senior in Agronomy by those students who do not elect research work in Agricultural Engineering or Soils. Original experimentation and study of special problems relating to cereal, forage, root and other crops. Experiments may be conducted in greenhouse or field. Includes the testing of vitality, purity of seeds, pollination and diseases of grains and their treatment. Prerequisites, Farm Crops 1 and 2. Three hours credit. Laboratory, six hours per week. Fee, $2.00.

10. **Advanced Research Work in Farm Crops.** Elective either semester, Junior or Senior year, in all Agricultural Courses. Original investigation in the chemistry of various field crops, including composition of the cereals and forage crops subject to different conditions and other questions treating upon the economic production and use of farm crops. Especially equipped Farm Crops Chemical Laboratory furnishes excellent facilities for this work. This course offers special advantages for thesis work. Three hours credit. Laboratory, six hours per week. Fee, $5.00.

11. **Advanced Corn Judging.** Elective first semester Junior or Senior year in all Agricultural Courses. Intended to fit students more thoroughly to become competent corn judges at institutes and fairs or specialists in corn production. The time is devoted entirely to the judging of corn. All the leading varieties are given special consideration. Prerequisite, Farm Crops 3. Three hours credit. Laboratory, six hours per week. Fee, $2.50.

12. **Advanced Grain Judging.** Elective second semester, Junior or Senior year in all Agricultural Courses. This course is intended to fit students more thoroughly to become competent grain judges and to fill positions as grain inspectors. The work in the grading of grain will be practically the same as that carried on by the Chicago Board of Trade, and supplies an excellent opportunity for students desiring to make special study along these lines. Together with the smaller cereals, the commercial grading of corn will also receive attention. Prerequisite, Farm Crops 4. Two hours credit. Laboratory, 4 hours per week. Fee, $2.50.

15. **Thesis.** Required second semester Senior year in Agronomy. Must be upon some subject requiring original work in Farm Crops. Three hours credit.

16. **Thesis.** Same as Farm Crops 15 except five hours credit.

GRADUATE WORK IN FARM CROPS.

Post graduate work may be taken in advanced grain judging. This consists of original investigations of any farm crop or crops, they being treated from both the scientific and practical standpoint. This work is designed to train students to hold positions with seed firms, in agricultural experimental work, along special seed or crop lines in the United States Department of Agriculture, or to still further prepare them to solve the complex problems of the farm. Having access to the fields and to the excellent laboratory facilities which are offered, post graduates may obtain a very thorough course from both the scientific and practical standpoint.

COMMERCIAL JUDGING AND GRADING OF GRAINS.

An opportunity for study along the lines of commercial judging and grading of grains is also offered, thus preparing graduates for positions as grain inspectors. A graduate of any institution who has not had the equivalent of the work offered in the previous courses in Farm Crops, will be given an opportunity for taking a special course in judging and grading cereals and forage crops. A student pursuing advanced work in the commercial grading of grains must have six weeks training under an efficient inspector at an important grain center before completing the course.

DEPARTMENT OF AGRICULTURAL ENGINEERING.

J. B. DAVIDSON, PROFESSOR.
E. W. HAMILTON, INSTRUCTOR.
J. T. HOOVER, ASSISTANT.
R. E. CARR, ASSISTANT.

The development of modern agricultural machinery, the increase in the size and importance of farm structures, the improvement of land by drainage and its reclamation by irrigation and the need of better roads, demand that the successful farmer of today must be trained along mechanical and engineering lines. To supply this training and to investigate problems related thereto is the work of the Department of Agricultural Engineering.

It is believed that this department has the most complete equipment of any similar department in existence. It is at present housed in Agricultural Engineering Hall, a fire proof building to the rear of Agricultural Hall. Upon the completion of New Agricultural Hall additional room in the older building will be provided the department.

Some of the features of the equipment are as follows: The laboratories contain over twenty thousand dollars worth of farm machinery. Surveying instruments are provided sufficient to equip fourteen field parties. The Forge shop is equipped with twenty Buffalo down draft forges and individual tool sets together with a complete set of special tools, a press drill and grinder. The carpenter shop has benches and tool sets for thirty students and a miscellaneous tool equipment is provided in the tool room. This shop is also provided with a power cross cut and rip saw, a planer and two speed lathes.

The experimentalist is provided with a separate laboratory and devotes his entire time to research. This laboratory has many special instruments in the way of dynamometers, indicators, and testing machines, and also a tool equipment including a fourteen-inch engine lathe.

The work of the department is principally that of giving instruction to those who intend to make the farm the object of their life work; however, the demand for instructors and others trained along these lines requires the department to offer special instruction to meet this demand. Students specializing may select such studies from the Engineering Division as will meet the approval of the Deans of the two divisions and the heads of the departments concerned.

COURSES IN AGRICULTURAL ENGINEERING.

1. **Shop Work.** Required either first or second semester of the Freshman year in the Agricultural course. Blacksmithing, forging and welding of iron and steel, and making and tempering hand-tools. Work designed to be especially helpful in the repair and operation of machinery. Two hours credit. Four hours per week. Fee, $2.50.

2. **Shop Work.** Required either first or second semester of the Freshman year in the Agricultural course. Carpentry, care, use and sharpening of tools, laying off work, making of joints and framing. Work designed to be especially helpful in the planning, framing, and construction of farm buildings. Two hours credit. Four hours per week. Fee, $2.50.

3. **Farm Blacksmithing and Horse Shoeing.** Elective first semester, Junior or Senior year in all Agricultural courses. An advanced course in blacksmithing. Two hours credit. Laboratory, four hours per week. Fee, $2.50.

4. **Farm Engineering.** Required first semester Sophomore year in Agronomy, Animal Husbandry, Horticulture and Science and Agriculture, and elective in Dairy course. Includes instruction in Agricultural surveying, also a study of location of drainage districts, drainage laws, and best systems of drainage; location and construction of roads; the building of fences and concrete construction in farm work; also drawing, including lettering, map making, planning of drainage systems and road profiles; and field work, including care, adjustment and practice in the use of surveying instruments. Prerequisite, Mathematics 17. Four hours credit. Recitation, two hours and laboratory, four hours per week. Fee, $2.00.

5. **Farm Machinery and Farm Motors.** Required second semester Sophomore year in Agronomy and Animal Husbandry, and elective

second semester Junior or Senior in all other Agricultural courses. Includes a brief study of mechanics and materials; a study of the development, construction, functions and methods of operating, adjusting and repairing implements and machinery; also the study of the principles of draft and the production of power. Laboratory work devoted to the comparative analysis and testing the machines discussed in the class room. Three hours credit. Recitations, two hours and laboratory, two hours. Fee, $2.00.

6. **Rural Architecture.** Elective second semester Junior or Senior year in all Agricultural courses. Embraces the planning of all farm buildings, a study of their construction, lighting, ventilation, cost, convenience, also testing the strength of building materials, and making of plans and specifications. Prerequisite, Agricultural Engineering 4. Three hours credit. Recitation, one hour and laboratory, four hours per week.

7. **Dairy Engineering.** Required first semester Sophomore year in Dairying and first semester of One Year Dairy Course, elective first semester Junior or Senior year in all other Agricultural courses. Special work in the management, care and operation of steam and gasoline engines. Two hours credit. Recitation, one hour and laboratory, two hours per week. Fee, $2.00.

8. **Spraying Apparatus.** Required second semester Sophomore year in Horticulture. Elective in second semester Junior or Senior year of all other Agricultural courses. Precedes Field Practice in Horticulture 7 in the same semester. A brief study of the mechanics, of pumps, also the care, operation and repair of spraying apparatus. One hour credit. Recitation, one hour and laboratory, two hours per week for one-half semester. Fee, $1.00.

9. **Research Work in Agricultural Engineering.** Required second semester Junior year in Agronomy by all students who do not elect research work in Soils or Farm Crops. The large equipment of machinery and instruments in this department offers to the student a wide range of subjects for research work, as Drainage, Farm Water Supply, Sewerage, Road Construction, Fences, Use of Cement on the Farm, Testing and Calibrating various Farm Machines. Traction tests. Prerequisites, Agricultural Engineering 4 and 5. Three hours credit. Fee, $2.00.

10. **Research Work in Agricultural Engineering.** Required first semester Senior year in Agronomy by all students who do not elect research work in Soils or Farm Crops. Work same as in 9. Prerequisites, Agricultural Engineering 4 and 5. Three hours credit. Fee, $2.00.

11. **Thesis.** Required second semester Senior year in Agronomy. Must be upon some subject requiring original work taken in Farm Crops, Agricultural Engineering or Soils. Three hours credit.

12. **Thesis.** Same as Agricultural Engineering 11 except five hours credit.

Post Graduate Work in Agricultural Engineering.

Students may take up graduate work along any of the many lines of Agricultural Engineering. This training will prepare them for government positions in agricultural engineering lines, for teaching in Agricultural colleges, or for becoming managers or superintendents of farms. Investigation may be carried on along any special line which they are fitted to pursue. The following subjects are suggested: (A) Irrigation, studying the principles employed and the machinery used and its efficiency, also practical work in sewage irrigation on the College Farm; (B) Farm Architecture, the locating, designing, constructing, drawing up specifications and contracts, and estimating cost of all farm buildings; (C) Road Construction, thus fitting students for becoming highway engineers; (D) Investigation of Farm Implements, their construction and efficiency, also comparison of different makes. The department, having an equipment of $20,000.00 worth of modern implements, offers splendid opportunities for this line of investigation; (E) Farm Motors, the efficiency of steam traction and gasoline engines, also a comparison with the horse as power; and (F) Drainage, thus fitting students as drainage engineers. The co-operative experiments of this department with the United States Department of Irrigation and Drainage Investigation, furnish a good opportunity for study along this line.

DEPARTMENT OF SOILS.

WILLIAM HENRY STEVENSON, PROFESSOR.

JOSEPH F. BARKER, INSTRUCTOR.

A. H. SNYDER, EXTENSION WORK.

On the first floor of Agricultural Hall, a commodious and well appointed soil laboratory accommodating seventy-five students has been thoroughly equipped for accurate and scientific work.

Over three thousand dollars have been expended for new soil apparatus, thus affording unsurpassed facilities for regular, advanced and graduate students in soils. The desks, hoods and balance rooms are of latest design; the desk apparatus for individual work is complete. Each desk is supplied with water, gas, steam, and compressed air. The centrifuge, shaker and other pieces of soil apparatus are run by individual motors.

The department also has two large rooms in the new greenhouse, which are devoted to pot culture work and various lines of soil experimental work. Plots on the Station farm are available for class and experimental work.

COURSES IN SOILS.

1. **Soil Physics.** Required first semester Sophomore year in Horticulture, and first semester Junior year in Agronomy, Animal Husbandry, and Science and Agriculture, elective Junior or Senior year in Dairy course. This course comprises a study of the origin, formation and classification of soils; soil moisture and methods of conserving it; soil temperature, and conditions influencing it; soil texture as affecting heat, moisture and plant food; surface tension, capillarity, osmosis, and diffusion as affecting soil conditions; the effect upon the soil and the crop of plowing, harrowing, cultivating, cropping, and rolling; washing of soils and methods of preventing the same; preparation of seed beds; cultivation and drainage as affecting moisture, temperature, root development and the supply of available plant food. Special attention will be given to the mechanical analysis of soils by the centrifuge method. The work also comprises the determination of the specific gravity, apparent specific gravity, volume, weight, porosity, water-holding capacity, and capillary power of various soils; also a study of the effect of mulches on the evaporation of water from the soil and the physical effects upon the soil of different systems of rotations and of continuous cropping. Five hours credit. Recitations, three hours and laboratory, four hours per week. Fee, $3.00.

2. **Soil Fertility.** Required second semester Junior year in Agronomy, Animal Husbandry, Horticulture, and Science and Agriculture and elective Junior or Senior year in Dairy course. Maintenance of Fertility; Fertilizers and Rotations. The influence of commercial fertilizers, barnyard manure, and green manuring upon the quality and yield of various crops; the effect of different crops upon the fertility of the soil and upon succeeding crops; different systems of rotation and the effect upon the productiveness of the soil of various methods of soil management; also a study of the storing, preserving, and application of farmyard manure.

This work is supplemented by a study of manures, fertilizers and soils; their composition and agricultural value. Pot and field experiments are conducted to show the influence of fertilizers, applied to the soil in different quantities and at different times, upon the quality and yield of various crops. Leguminous crops as fertilizers and their place in crop rotation. A study is made of special types of soil in different sections of the state, such as clay, gumbo, loess, and peat with special reference to the best methods of handling and cropping these soils. Prerequisites, Soils 1, and Chemistry 25. Five hours credit. Recitation, three hours and laboratory, four hours per week. Fee, $5.00.

3. **Research Work in Soil Physics.** Required second semester Junior year in Agronomy for all students who do not elect research work in Farm Crops or Agricultural Engineering. Original research

ork in soil physics. Three hours credit. Three laboratory periods per eek. Fee, $2.00.

4. Research Work in Soil Fertility. Required first semester enior year in Agronomy for all students who do not elect research ork in Farm Crops or Agricultural Engineering. Original investigations soil fertility. Three hours credit. Laboratory, six hours per week. ee, $2.00.

5. Avanced Soil Physics. Elective second semester Junior or enior year in all Agricultural courses. Students who take this course re also required to take Soils 10. Study of the physical properties of oils; the determination of the temperature, moisture and soluble salt ontent of various soils under field conditions; green house, laboratory nd field experiments to study the effect upon soil conditions of different nethods of soil management, also a study of the soils of the United States; their location, classification and relation to crop production. This course is also intended for students wishing to make a study of soil surveying and mapping. Prerequisite, Soils 1. Two hours credit. Laboratory, four hours per week. Fee, $2.00.

6. Advanced Soil Fertility. Elective first semester Senior year in all Agricultural courses. Soils 9 is required of students classified in this course. Study of the fertility and productiveness of particular types or classes of soils; the nature and quantity of the elements of fertility in soils; the effect of fertilizers added to the soil upon the growth and yield of various crops as determined by pot cultures and experiments; also includes lectures and assigned readings, study of results of previous investigations, and written report of results of experiments and investigations made by the student. Prerequisites, Soils 1 and 2. Two hours credit. Recitation, one hour; laboratory, two hours per week. Fee, $2.00.

7. Investigation of Special Soils. Elective second semester Senior year in all Agricultural courses. Students who take this course are also required to take Soils 10. This course is designed to enable the student to study one or more types of soil in which he may be particularly interested and to become familiar with correct principles and methods of soil management. Two hours credit. Recitation, one hour. Laboratory, two hours per week. Fee, $2.00.

8. Soil Bacteriology. Elective second semester Junior or Senior year in all Agricultural courses. A study of those organisms found principally in the soil, including a study of the decomposition of nitrogenous and carbonaceous matter; nitrification, dentrification and the assimilation of atmospheric nitrogen, thus furnishing the student with a knowledge of the relation of bacteria to the soil and to plant growth. Prerequisites, a knowledge of chemistry and general bacteriology. Three hours credit. Lecture, one hour, and laboratory, four hours per week. Fee, $4.00.

9. **Soil Seminar.** Required first semester Senior year of students classified in Advanced Soil Fertility, (Soils 6). Consists of the presentation and discussion of data concerning the soils of the United State with special reference to their physical and chemical characteristics and relation to crop production. One hour credit. One hour per week.

10. **Soil Seminar.** Required second semester Senior year of students classified in Advanced Soil Physics (Soils 5); Investigation of Special Soils (Soils 7) or Thesis (Soils 11 or 12). Consists of preparation presentation and discussion of papers upon special assigned topics in Soils. The papers must be carefully written and submitted to the professor in charge. One hour credit. One hour per week.

11. **Thesis.** Required second semester Senior in Agronomy Students who take this course are also required to take Soils 10 Must be upon some subject requiring original investigation, taken in Farm Crops, Agricultural Engineering or Soils. Three hours credit.

12. **Thesis.** Same as Soils 11, except has five hours credit. Students who take this course are also required to take Soils 10.

Graduate Work in Soils

Post graduate work is offered in Soils which prepares the student for special work in the United States Bureau of Soils or in Colleges and State Experiment Stations. The work may be taken in either Soil Physics or Soil Fertility as a continuation of work taken as an undergraduate in this college or of any line of soil study which has fitted the student to pursue advanced work.

The graduate student will find excellent opportunities for investigations in soils along any of the following lines:

(A) The relation of soil types to crop production; (B) Soil types; methods of surveying and mapping; (C) The management of certain types of soil to improve their physical condition; (D) The mechanical composition of soils; Its influence upon the physical properties affecting crop production; (E) Erosion of soils and methods of prevention; (F) The relation of farm manures, fertilizing materials and crop rotations to the maintenance of fertility; (G) Pot culture, bottle and wire basket investigations to determine the manurial requirements of soils; (H) The comparative value of important types of soils based upon their composition; (J) Methods of investigating the soils of a state; (K) Methods of rendering more productive certain types of soil such as sandy, peaty and loess soils; (L) The relation of the organic matter content of soils to crop yields with special reference to the changes which take place in the plant food content and in the physical condition of the soil; (M) The soils of the United States with special reference to crop adaptation.

The graduate student is not limited to these lines of investigation; he may work on any subject which meets the approval of the head of the department.

DEPARTMENT OF DAIRYING

G. L. MC KAY, PROFESSOR.
F. W. BOUSKA, ASSOCIATE PROFESSOR, DAIRY BACTERIOLOGIST.
JOHN BOWER, ASSISTANT PROFESSOR.
HERMAN HORNEMAN, INSTRUCTOR.
A. H. CHADSEY, REFRIGERATION ENGINEER.

The work of the Dairy Department is that of giving instruction and raining to fit men for the various callings in dairying, of Experimentaion and the investigation and discovery of facts relating to this industry.

Owing to the rapid progress and the application of scientific principles to the dairy industry, it is necessary that those engaged in this work should keep in touch with new ideas and principles. In order to meet this demand, the dairy department offers first, a four year course for qualifying students to become competent teachers and investigators of dairying in agricultural colleges and experiment stations, inspectors of dairy products and creameries in municipal, state and government service, or superintendents of large creameries or dairy farms; second, one year course, for fitting students for becoming operators of creameries, cheese factories, and dairy farms; and third, a two weeks' short course, for acquainting experienced dairy and creamery men with new methods and investigations which they cannot learn in their own factories.

The Dairy Department with its new building and the Dairy farm with its herd, offer unexcelled facilities for teaching Dairying in a thoroughly practical and scientific manner. The dairy farm of 200 acres, is well stocked with various types and breeds of milk cows. The milk from this herd together with the milk and cream shipped and hauled to the college supplies all the needs of the creamery.

The Dairy Building is a practical working creamery and cheese factory in operation throughout the year. The products made bring the highest quotations and have an enviable reputation in the markets of the United States and England.

The student becomes familiar with all the practical work connected with a commercial creamery, weighing the milk brought in by the patrons and testing the same, running the engines, caring for the factory rooms and machines, and shipping the butter. The aim is to teach not only how but why the work is so done. During the senior year, the students who have proven themselves capable, do original research work in the laboratory, the results of which if of value to others are reported in the bulletins of the Experiment Station.

The studies other than dairying offered in this course are such as give the student a knowledge of the scientific principles upon which this work depends and a broad and general education.

Students in all the dairy work are required to provide themselves with white suits, keep them clean and in good order.

WINTER COURSE IN DAIRYING

(January 4, 1909, to January 16, 1909).

The prominent rank attained by students of the Iowa Dairy School in state and national contests has led to a demand for special instruction. A course in Butter Making and one in Farm Dairying are now offered during the winter in order to meet this demand.

In the course in Butter Making, special attention will be paid to the handling of hand separator cream so as to make the best grade of butter possible, the proper controlling of moisture and salt in butter, the removal of undesirable flavors from cream, the preparation of starters, the pasteurization of cream, and the analysis of butter.

This course is intended especially for experienced butter makers, inexperienced men not being admitted. A fee of $12.00 is charged for admission to this course in order to cover the expenses of securing extra instructors and of the materials used.

The course in Farm Dairying is especially intended for farmers, farmers' wives and daughters who are interested in improving the quality of dairy butter. The instruction given will include the care and testing of both milk and cream, best methods of manufacturing butter on the farm, and the construction and care of the hand separator. A fee of $2.00 is charged for admission to this course.

COURSE IN DAIRYING.

For Freshman year, see Agricultural Course, page 65. All Agricultural students will take the same work until the beginning of the Sophomore year.

Sophomore Year.

FIRST SEMESTER.

		Required semester hours
Agricultural Engineering 7,	Dairy Engineering	2
Animal Husbandry 3,	Breed Types of Cattle and Sheep	4
Horticulture 3,	Orcharding	3
Agricultural Chemistry 21,	Elementary Experimental Chemistry	5
English 12,	Argumentation	2
Economic Science 9,	Outlines of Economics	3
Military 3, or Athletics,		
	Total semester hours	19

SECOND SEMESTER.

			Required semester hours
airying 11,	Cheese Making		4
airying 13,	Milk Testing and Milk Inspection		2
nimal Husbandry 4,	Breed Types of Dairy Cattle, Horses and Swine		4
gricultural Chemistry 23,	Elementary Experimental Chemistry		5
Economic Science 10,	Agricultural Economics	3	3
History 6,	French Revolution and XIXth Century	3	
ilitary 4, or Athletics,			
	Total semester hours		18

Junior Year.

FIRST SEMESTER.

		Required semester hours
Dairying 14,	Advanced Butter Making	4
Animal Husbandry 21,	Principles of Breeding	2
Agricultural Chemistry 25,	Agricultural Analysis	4
		10

Elective:

The student will select from the list of electives on page 111, enough work to make a total of from sixteen to twenty hours per week	6 to 10
Total semester hours	16 to 20

SECOND SEMESTER.

		Required semester hours
Dairying 16,	Technology of Milk	1
Dairying 24,	Fancy Cheese Making	3
Botany 40,	General Bacteriology	2
Agricultural Chemistry 26,	Agricultural Analysis	4
		10

Elective:

The student will select from the list of electives on page 111, enough work to make a total of from sixteen to twenty hours per week	6 to 10
Total semester hours	16 to 20

Senior Year.

FIRST SEMESTER.

		Required semeste hours
Dairying 17,	Dairy Bacteriology	4
Dairying 18,	Scoring Butter and Cheese	1
Dairying 19,	Seminar Work	2
Animal Husbandry 9,	Animal Nutrition and Packing House By-Products	2
Veterinary 44,	Sanitary Science	2
		11
Elective: The student will select from the list of electives on page 111, enough work to make a total of from sixteen to twenty hours per week		5 to
	Total semester hours	16 to

SECOND SEMESTER.

		Required semeste hours
Dairying 20,	Factory Management	3
Dairying 21,	Preparation of Ice Cream and Ices	1
Dairying 23,	Thesis	2
Animal Husbandry 15,	Milk Production	1
		7
Elective: The student will select from the list of electives on page 111, enough work to make a total of from sixteen to twenty hours per week		9 to 1
	Total semester hours	16 to

COURSES IN DAIRYING

1. Dairy Practice. Required the first and second semester i one year Dairy Course. The first semester, practical work in cheese making, the second, in butter making. From five to seven hours in practical laboratory work per day.

2. Buttermaking. Required the second semester in one yea Dairy Course. It includes a study of the composition of milk and dair products, the principles of gravity and centrifugal separation of crea m ripening, preparation of starters, churning, and preparation of er for market. Sixteen lectures per semester.

3. **Milk Testing.** Required the second semester in the one year y Course. A study of the Babcock test, and of the Farrington Manns' test for determining acidity, the use of the lactometer for cting adulterations, and also the composite sampling and testing ndividual cows. One hour credit.

5. **Bookeeping.** Required the second semester of the one year ry Course. Study of the best form of bookkeeping for the factory ness. One hour credit.

6. **Dairy Bacteriology.** Required the first semester of the one r Dairy Course. Application of the principles of bacteriology in care of milk, and in butter and cheese making. One lecture per k.

8. **Cheese Making.** Required the first semester of the the one r Dairy Course. Includes common and fancy cheese as Limburger, ck, Swiss, Roquefort, Sage, Stilton, Pineapple, and Gouda. Sixteen ures per semester.

For the above courses, all of which are offered in the one year iry Course, a fee of $10.00 per semester is charged.

10. **Domestic Dairying.** Elective in second semester Junior or ior years in Domestic Economy, and all Agricultural Courses. Study those dairy subjects that interest the housekeeper and dietetist. The portant topics are: The nutritive and economic value of milk; its tetics and hygiene; market milk, infants' milk, invalids' milk, cream, cream, condensed milk, milk chocolates, malted milk, dried milk, fer- nted milks (Kephir, Koumissete), buttermilk, butter, and cheese. monstrations are given in types of butter and cheese and in testing purity of milk and butter. Two lectures per week. Fee, $2.00.

11. **Cheese Making.** Required the second semester of the Soph- ore year in the Dairy Course and elective the second semester of Junior or Senior year in all other Agricultural courses. A study of importance of the quality and composition of milk in the manufac- re of Cheddar cheese; the principles involved in cutting, heating lling, salting and pressing the curd, curing and marketing; influence organized and unorganized ferments in cheese; and the construction d ventilation of cheese curing rooms. Four hours credit. Recita- n, one hour and laboratory, six hours per week. Fee, $3.00.

12. **Farm Dairying.** Required the second semester of the Fresh- n year in the Agricultural Course. Includes a general study of the cretion, composition, testing, separation and acidity of milk, prepara- n of starters, ripening of cream, and churning and packing butter. ree hours credit. Recitations, two hours and laboratory, two hours r week. Fee, $3.00.

13. **Milk Testing and Milk Inspection.** Required the second mester of the Sophomore year in the Dairy Course and elective in

Junior and Senior in all other Agricultural Courses and required Juniors in the Veterinary Course. A study of the Babcock test, Fa rington's and Manns' test for determining acidity, the use of the lact meter for detecting adulteration, composite sampling, and testing individual cows, and detection of different preservatives and adulteratio Two hours credit. Recitation, one hour, and laboratory two hours p week. Fee, $2.50.

14. Advanced Butter Making. Required the first semester of t Junior year in the Dairy Course and elective the first semester the Junior or Senior year in all other Agricultural Courses. A study the physical and chemical properties, secretion and composition; separati of milk, cream ripening, the principles of churning, packing and marketi butter. Prerequisite, Agricultural Chemistry 21. Four hours cred Recitations, two hours and laboratory four hours per week. Fee, $3.

16. Technology of Milk. Required the second semester of t Junior year in the Dairy Course and elective the second semester the Junior or Senior year in all other Agricultural Courses. A stu of the utilization of milk and its products, as the preparation of co densed, modified, and milk sugar, casein, and the food value of milk a its products. Prerequisites, Agricultural Chemistry 21, 23 and 25. Reci tion, one hour per week. Fee, 50 cents.

17. Dairy Bacteriology. Required the first semester of Seni year, in the Dairy Course and elective the first semester, Junior Senior year in all other Agricultural courses. A study of the functio of bacteria and the application of bacteriological principles to da work. Prerequisites, Botany 40, and Chemistry 21, 23, 25 and Four hours credit. Recitations, two hours and laboratory, four hou per week. Fee, $4.00.

18. Scoring Butter and Cheese. Required the first semes of the Senior year in the Dairy Course, and the first semester of One Year Dairy Course, and elective Junior or Senior in all other Ag cultural Courses. A study of the standard market requirements for da products, also the examination and scoring of butter and cheese. O hour credit. Fee, $3.00.

19. Seminar Work. Required the first semester of the Sen year in the Dairy Course. A study of various authorities on Dairy together with the work of the experiment stations on this subj Prerequisites, Botany 40, Dairying 11 and 14. A knowledge of Fre and German is recommended. Two hours per week.

20. Factory Management. Required the second semester of t Senior year in the Dairy Course and the second semester of the C Year Dairy Course and elective Junior or Senior in all other Agricultu courses. Consists of the location, organization, construction, draina and ventilation of factories, the treatment of the by-products, and crea ery refrigeration, thus qualifying a student to superintend or manag large factory or dairy establishment. It is advisable for students to in he laboratory during vacation or when work can be done during ecutive days. Prerequisite, Dairy 14. Three hours credit. Lecture, r hour and laboratory, four hours per week.

21. **Preparation of Ice Cream and Ices.** Required the second se ester of the Senior year in the Dairy Course, and elective in second se ester of the Junior or Senior year of all Agricultural courses. A st ly of the preparation of ice cream, sherbets, and ices made on a private o commercial scale. Both lectures and laboratory. One hour credit. F , $2.50.

23. **Thesis.** Required the second semester of the Senior year i the Dairy Course. Original work on some dairy subject. May be w ked out in co-operation with the departments of chemistry or bacteric gy. Students should consult the professor concerning their subject a or before the beginning of their Senior year. Two hours per week.

24. **Fancy Cheese Making.** Required the second semester of t Junior year in the Dairy Course, and elective Junior or Senior in all o er Agricultural courses. Includes making the varieties found in American market as Limburger, Swiss, Brick, Roquefort, Sage, lton, Pineapple, Gouda, Gorgonzola, and Neufchâtel. Three hours c dit. Lecture, one hour and laboratory, four hours per week. Fee, $ 00.

ONE YEAR COURSE IN DAIRYING.

The one year course in dairying is designed to meet the needs of t se who want to acquire a knowledge of practical dairy methods as ll as the scientific principles underlying the work. This course in udes one college year beginning in August and ending in June. Stu nts completing this course will be given certificates when evidence furnished that they have successfully for one year operated a cream y or other dairy establishment.

ONE YEAR COURSE IN DAIRYING.

FIRST SEMESTER.

		Required semester hours
airying 1,	Dairy Practice	6
airying 8,	Cheese Making	1
gricultural Engineering 7,	Dairy Engineering	2
nimal Husbandry 19,	Feeding Dairy Stock	2
hemistry 28,	Dairy Chemistry	2
airying 18,	Scoring Butter and Cheese	1
airying 6,	Dairy Bacteriology	1
	Total semester hours	15

SECOND SEMESTER.

		Required semest hours
Dairying 1,	Dairy Practice	6
Dairying 2,	Butter Making	1
Dairying 3,	Milk Testing	1
Dairying 5,	Bookkeeping	1
Dairying 20,	Factory Management	1
Animal Husbandry 18,	Breeding and Judging Dairy Stock	2
Chemistry 29,	Dairy Chemistry	2
	Total semester hours	14

DEPARTMENT OF ANIMAL HUSBANDRY.

W. J. KENNEDY, PROFESSOR.
WAYNE DINSMORE, ASSOCIATE PROFESSOR.
J. A. MCLEAN, ASSOCIATE PROFESSOR.
H. G. VAN PELT, ASSISTANT PROFESSOR AND SUPT. OF DAIRY FARM.
H. C. PIERCE, INSTRUCTOR IN CHARGE OF POULTRY.
E. N. WENTWORTH, ASSISTANT.
R. K. BLISS, EXTENSION WORK.
R. E. DRENNAN, EXTENSION WORK.

The department of Animal Husbandry stands for all lines of wo
which pertain to the judging, selecting, breeding, feeding, developme
care and management of the various breeds and classes of domesticat
animals. Because of the importance of the live stock industry to t
welfare of the state and because of the demand for instruction in tl
line, the equipment for instruction has been made as complete in eve
detail as possible.

The herds and flocks, established at an early date have been add
to from time to time until our equipment in this line, consisting
almost all recognized breeds of animals, places us in a position to
work in Animal Husbandry lines which cannot be accomplished in th
institutions where such specimens are not furnished for instruction. I
lieving that training the eye is the only way to make a young man
proficient judge of live stock, the work of the lecture room and laborato
is demonstrated by the use of living specimens.

The two commodious judging pavilions, located near the barn, affc
ample room for dividing the classes into many sections thus allowi
individual work.

An excellent collection of horses representing all the market clas
and the breeds of both light and heavy types is maintained for instru
tion purposes. Among these are good representatives of the Shir
Percherons, Clydesdales, French Coachers, Hackneys, Standard bre

a American Saddle Horses. Some of the horses are imported; while t others have been purchased with much care in their selection, from t best breeders on the continent.

More than two hundred head of cattle, representing all the leading ef, dual purpose, and dairy breeds are maintained on the farm. Com- te breeding herds of most of the breeds are kept. An excellent col- tion of steers, representing the highest type of fat steer, and all the her classes and grades to be found in our leading markets down to e very lowest grades, is always available for class work. This affords r students an excellent opportunity to study the market demands and know what constitutes each class, also why there is such a wide mar- n in the prices paid for cattle by the packer.

The dairy farm is well stocked with dairy cattle, including a herd about a hundred representatives of the Holsteins, Jerseys, Guernseys, yreshires, milking Shorthorns, with good sires of the different breeds. his equipment affords an excellent opportunity for class work when udying the origin, history, and development of the different breeds f dairy cattle, their characteristics and the conditions under which ey are evolved; also for carrying on investigations along the lines of reeding, feeding and management of the dairy herd for profit; and the elative values of home grown feed stuffs and by-products in the roduction of milk and butter fat.

The flock of sheep, consisting of over 200 head of seven different reeds have been carefully selected to represent the type and character- stic of each breed both in regard to form and wool bearing qualities. n addition to the breeding flocks, the department has a choice collection f fat wethers which affords an opportunity for the student to familiar- ze himself with the highest type of finished mutton sheep. All these re available for class work.

In the swine department, representatives of six breeds of the best American and British varieties are maintained. As in the other departments, the aim in this has been to keep in touch with the modern ideas of leading breeders, both in regard to breeding and the type of the animals in these breeds.

At all seasons of the year there is more or less feeding of market stock being done on the farm and in connection with the Experiment Station, so that excellent material is always available for instruction purposes regarding the qualities that add to the value of stock for the ordinary market. Having pure bred representatives, it is easy to inform the student in a practical way on the finer points of color, type, and other characteristics that relate to the pure bred classes of stock.

To assist further in this work, the herd books of the different American and foreign registry associations are being constantly added to the library. The College possesses the most complete set of the English Shorthorn herd books in existence in America. Through herd book study, the student is enabled not only to inform himself in regard to pedigrees, but he is enabled also to study the different scales of points which the breeders have adopted to represent the highest types of tl various breeds.

The department is also equipped with photographs, charts, ar lantern slides which are used in the lecture room when it is impossib to illustrate with the living animal. The abundant material availab from the herds and flocks is used extensively in all lectures and sco card practice. By means of score cards prepared by the departmer the students are brought in close contact with the animals, and throug them are informed on the points of market merit desirable in ordinar stock while later the use of the official scale of points for the differe breeds in a similar way, makes them skillful in judging representativ of different breeds.

As soon as the student is familiar with the use of the score car comparative judging is introduced. In comparative judging from fo to six animals are used, and each student is required to place all tl animals in order of merit, and write down clearly and concisely on blank folder, prepared especially for this work, full reasons for makir his awards. This kind of work teaches the student to compare anima and to balance the weak and the strong points of each in making h final awards. As soon as the student demonstrates his ability to plac classes well, herd groups and sweepstake classes are introduced durin his Senior year's work. This kind of work is similar to the most difi cult judging done at our leading state fairs and international exposition As soon as the student shows that he possesses the qualifications neede to judge stock in the show ring, he is sent out, in answer to the man requests from the secretaries, to judge various classes of stock at count fairs. This in connection with his college work, results in establishin the lessons learned in the class room.

Positions Open for Men Trained Along Animal Husbandry Lines.

There is a great demand for competent young men trained alon the lines of practical and scientific Animal Husbandry work, men wh combine their college training with practical experience and nativ ability. Such is the training offered to the young men in this cours The demand for such students is unlimited at a compensation not exceeded in any other calling. A few of the many lines of work open t graduates of this department are: College and experiment station worl agricultural journalism, managers of stock farms, salesmen with commission merchants, buyers for the packing houses at the many stoc yard centers, and salesmen of animal feedstuffs manufactured by th packing houses, glucose companies, linseed and cotton seed oil companies.

Clay, Robinson & Co. Fellowship Prizes.

Clay, Robinson & Co., Live Stock Commission Merchants, Unio Stock Yards, Chicago, offer annually $1,000.00 in prizes to be awarde to the Agricultural Colleges making the best exhibit of live stock a he International Live Stock Exposition held at Chicago in December of ach year. They stipulate that the money won by the various colleges hall be used for the establishment of fellowship prizes to be awarded o graduate students in the department of Animal Husbandry. These ellowships, amounting to $250.00 per student annually, are granted by he Board of Trustees upon the recommendation of the dean of the Division of Agriculture and the head of the department. A student olding a fellowship may pursue post-graduate work in Animal Husbandry.

WINTER COURSE IN STOCK JUDGING.

(January 4, 1909, to January 16, 1909).

In response to a widespread demand for special short course instruction in the judging and feeding of animals, a two weeks' course has been established during the winter vacation. This course will begin January 4, 1909, and continue for two weeks. It will be devoted exclusively to score card practice, and judging of horses, cattle, sheep, and hogs, and lectures on feeding the same.

In this work special attention will be given to the selection of animals best suited for feeding purposes. Good specimens of the highest type of fat steers and ideal representatives of all the various breeds will be used for class work. At the conclusion of the cattle work a slaughter test and block demonstration of the various market types of steers will be conducted under the supervision of John Gosling, Kansas City, Missouri. This course is intended especially for the man on the farm that cannot avail himself of the opportunity to take a complete course.

A special course in corn judging will be given at the same time and the work will be so arranged that all those present may take both lines of work.

To cover in part the expense of procuring additional help and stock for demonstration, a tuition fee of $3.00 for residents and $5.00 for non-residents will be charged for admission to this course, but one fee will cover the instruction in both grain and stock judging.

COURSE IN ANIMAL HUSBANDRY.

For Freshman year, see Agricultural Courses, page 65. All Agricultural students will take the same work until the beginning of the Sophomore year.

Sophomore Year.

FIRST SEMESTER.

		Required semester hours
Animal Husbandry 3,	Breed Types of Cattle and Sheep	4
Agricultural Engineering 4,	Farm Engineering	4

Zoology 2,	General Zoology	5
Agricultural Chemistry 21,	Elementary Experimental Chemistry	5
Horticulture 3,	Orcharding	3
Military 3, or Athletics,		
	Total semester hours	21

SECOND SEMESTER.

		Required semeste hours
Animal Husbandry 4,	Breed Types of Dairy Cattle, Horses and Swine	4
Agricultural Engineering 5,	Farm Machinery and Farm Motors	3
Zoology 3,	General Zoology	5
Agricultural Chemistry 23,	Elementary Experimental Chemistry	5
Botany 26,	Ecology	2
English 12,	Argumentation	2
Military 4, or Athletics,		
	Total semester hours	21

Junior Year.

FIRST SEMESTER.

		Required semeste hours
Animal Husbandry 11,	Feeding and Management of Live Stock	2
Animal Husbandry 30,	Poultry Judging	3
Agricultural Chemistry 25,	Agricultural Analysis	4
Soils 1,	Soil Physics	5
Zoology 5,	Embryology	3
		17
Elective:		
The student will select from the list of electives on page 111, enough work to make a total of from seventeen to twenty hours per week		0 to
	Total semester hours	17 to 2

SECOND SEMESTER.

		Required semester hours
nimal Husbandry 8,	Animal Breeding	2
nimal Husbandry 12,	Feeding and Management of Live Stock	2
nimal Husbandry 31,	Poultry Management	3
ils 2,	Soil Fertility	5
ology 8,	Animal Parasites	2
gricultural Chemistry 26,	Agricultural Analysis	4
nimal Husbandry 22,	Seminar	1
		19

lective:

The student will select from the list of electives on page 111, enough work to make a total of from nineteen to twenty hours per week	0 to 1
Total semester hours	19 to 20

Senior Year.

FIRST SEMESTER.

		Required semester hours
Animal Husbandry 6,	Advanced Live Stock Judging	2
Animal Husbandry 9,	Animal Nutrition and Packing House By-Products	2
Veterinary 19,	Obstetrics	1
Veterinary 44,	Sanitary Science	2
Veterinary 55,	Anatomy of Domestic Animals	2
		9

Elective:

The student will select from the list of electives on page 111, enough work to make a total of from sixteen to twenty hours per week	7 to 11
Total semester hours	16 to 20

SECOND SEMESTER.

		Required semester hours
Animal Husbandry 7,	Herd Book Study	2
Animal Husbandry 10,	Thesis	2
Animal Husbandry 13,	Advanced Work in Beef Production	1

Animal Husbandry 14,	Advanced Work in Pork Production	1
Animal Husbandry 15,	Milk Production	1
Animal Husbandry 16,	Advanced Work in Mutton and Wool Production	1
Animal Husbandry 17,	Advanced Work in Horse Feeding	1
Animal Husbandry 23,	Seminar	1
Veterinary 16,	Horse Shoeing	2
Veterinary 18,	Conformation and Soundness	2
Zoology 6,	Evolution of Animals	1
		15

Elective:

The student will select from the list of electives on page 111, enough work to make a total of from sixteen to twenty hours per week — 1 to 5

Total semester hours — 16 to 20

COURSES IN ANIMAL HUSBANDRY.

1. **Market Types of Cattle and Sheep.** Required the first semester of Freshman year in the Agricultural courses and first semester of Sophomore year in Veterinary Course. Includes the judging of different market classes of cattle, both beef and dual purpose, and sheep, both mutton and wool. Credit two hours. Two 2-hour judging periods per week. Fee, $2.00.

2. **Market Types of Dairy Cattle, Horses and Swine.** Required the second semester of Freshman year in the Agricultural course and second semester of Sophomore year in Veterinary course. Includes judging different market classes of dairy cattle, light and heavy horses, and swine, (bacon and fat). Two 2-hour judging periods per week. Fee, $2.00.

3. **Breed Types of Cattle and Sheep.** Required the first semester of Sophomore year in Agronomy, Dairy, and Animal Husbandry courses, and first semester of Junior year in Veterinary course. Includes judging representatives of different breeds according to their official standards, a study of their origin, history, characteristics, and adaptability to different conditions of climate and soil. Prerequisite, Animal Husbandry 1. Four hours credit. Lectures, two hours and two 2-hour judging periods per week. Fee, $2.00.

4. **Breed Types of Dairy Cattle, Horses and Swine.** Required the second semester of Sophomore year in Agronomy, Animal Husbandry, and Dairy courses, and second semester of Junior year in Veterinary course. Includes judging of representatives of different

reeds according to their official standards, a study of their origin, istory, characteristics, and adaptability to different conditions of climate nd soil. Prerequisite, Animal Husbandry 2. Four hours credit. Lecures, two hours and two 2-hour judging periods per week. Fee, $2.00.

6. **Advanced Live Stock Judging.** Required the first semester f Senior year in Animal Husbandry course. Includes judging horses, attle, sheep and swine, especially in groups similar to county and tate fair work. Prerequisites, Animal Husbandry 3 and 4, and Zoology and 3. Two hours credit. Two 2-hour judging periods per week. ee, $2.00.

7. **Herd Book Study.** Required the second semester Senior year n Animal Husbandry and elective the second semester of Junior or Senior year in all other Agricultural courses. Includes a study of herd books, with a view to becoming acquainted with the pedigrees of the leading strains and families of the different breeds of livestock. Prerequisites, Animal Husbandry 3 and 4. Recitations, two hours per week.

8. **Animal Breeding.** Required the second semester of the Junior year in the Animal Husbandry and Veterinary Courses. Embraces a study of principles of breeding, including selection, heredity, atavism, variation, fecundity, with the presentation of methods of breeding, in-and-in breeding, cross breeding, etc., and a historical study of their results, also the several features relating to the higher breeding of pure bred stock. Prerequisites, Animal Husbandry 3 and 4, and Zoology 5. Recitations, two hours per week.

9. **Animal Nutrition and Packing House By-Products.** Required the first semesteer of Senior year in Agronomy, Animal Husbandry, Dairy, and Science and Agricultural courses, and elective in Horticulture course. Study of anatomy and physiology of the digestive system, the purpose of nutrition, the theory and practical economy of rations for growth, fattening, milk or maintenance; sanitation of feeds and hygiene of the farm. Prerequisites for Agricultural courses, Chemistry 21, 23 and 25. Recitations, two hours per week.

10. **Thesis.** Required the second semester of Senior year in Animal Husbandry course. Must be along some line to be arranged with the head of the department. Two hours credit.

11. **Feeding and Management of Live Stock.** Required the first semester of Junior year in Animal Husbandry, first semester, Freshman in Veterinary, and elective first semester Junior or Senior year in all other Agricultural courses. The practical feeding, care and management of beef and dairy cattle. Two hours credit. Lecture, one hour and laboratory two hours per week. Fee, $2.00.

12. **Feeding and Management of Live Stock.** Required the second semester of Junior year in Animal Husbandry, second semester Freshman in Veterinary, and elective second semester Junior or Senior year in all other Agricultural courses. The practical feeding, care and management of horses, hogs and sheep. Prerequisite, Animal Husbandry

11. Two hours credit. Lecture, one hour and laboratory, two hours pe week. Fee, $2.00.

13. Advanced Work in Beef Production. Required the secon semester of Senior year in Animal Husbandry course. A systemati study of the most successful and economical methods of producing bee cattle for market purposes; production of baby beef; advisability of lon and short feeding periods; and the feeding of grain rations to cattle o grass. Prerequisites, Animal Husbandry 9, and Zoology 5 and 8. On hour credit. Five 1-hour periods per week for first five weeks.

14. Advanced Work in Pork Production. Required the secon semester Senior year in Animal Husbandry course. A systematic stud of most successful and economical methods of growing and finishin pigs of both the lard and bacon types for market purposes. Prerequisite Animal Husbandry 9, and Zoology 5 and 8. One hour credit. Fiv 1-hour periods per week for second five weeks.

15. Milk Production. Required the second semester of Senio year in Animal Husbandry and Dairy courses. Study of various feedin stuffs and the methods of preparing and feeding same as related to mos successful and economical production of milk. Prerequisite, Anima Husbandry 9. One hour credit. Five 1-hour periods during four week following Animal Husbandry 14.

16. Advanced Work in Mutton and Wool Production. Require second semester Senior year in Animal Husbandry course. A thoroug study of various feeding stuffs as related to economical production o mutton and wool. Prerequisites, Animal Husbandry 9, and Zoology and 8. One hour credit. Five 1-hour periods per week following Anima Husbandry 15.

17. Advanced Work in Horse Feeding. Required the secon semester of Senior year in Animal Husbandry course. A study of mos successful and economical methods of growing and developing youn animals; most economical and satisfactory rations for horses at light medium and heavy work; study of the feeding stuffs best adapted t the production of heavy and economical gains on horses which are bein fattened for market. Prerequisites, Animal Husbandry 9, and Zoology and 8. One hour credit. Five 1-hour periods per week following Anima Husbandry 16.

18. Breeding and Judging Dairy Stock. Required second semester of One Year Dairy course. Judging dairy stock with the score car and by comparative judging; also study of principles, methods and practice of breeding dairy stock and their improvement. Two hours credit Lecture, one hour and laboratory, one hour per week.

19. Feeding Dairy Stock. Required the first semester of on year Dairy course. Principles of feeding animals for the most economica production, with the composition and use of various feeding material feeding of dairy cows, including the influence of various feeding stuffs o the quantity, quality and composition of milk, butter and cheese. Tw lectures per week.

20 **Animal Feeding.** Required first semester of Junior year in
terinary Course. A study of the composition and digestibility of
ding stuffs; the preparation of coarse fodders; the grinding, steaming
l cooking of feeding stuffs; feeding standards and the calculation
rations; feeding for meat, milk, wool, growth and work. Prerequisites,
terinary 4 and 24, and Chemistry 13. Two hours credit.

21. **Principles of Breeding.** Required first semester of Junior
r in Agronomy and Dairy Courses and elective first semester of Junior
Senior year in all other agricultural courses. An elementary course
breeding offered to meet the demands of those students who have not
ficient foundation to take the regular course in Animal Breeding.
braces a study of the general principles of breeding, selection, varia-
n, heredity, atavism, etc., and a historical study of the results to
e. Prerequisites, Animal Husbandry 1 and 2. Two hours credit.

22. **Animal Husbandry Seminar.** Required first and second se-
sters of Junior year in Animal Husbandry course. One hour credit.

23. **Animal Husbandry Seminar.** Required first and second se-
sters Senior year in Animal Husbandry Course. One hour credit.

The Animal Husbandry Seminar Courses 22 and 23 meets once
h two weeks while college is in session, and has for its members
professors and instructors in Animal Husbandry, and all students
the Junior and Senior classes in the course in Animal Husbandry.
each meeting, four students—two Seniors and two Juniors—present
pers on associated Animal Husbandry topics. These subjects are
ected a half year in advance and follow, in regular series, Animal
eeding, Relation of Animal Husbandry to other industries, Animal
eding, and a study of Live Stock organizations, expositions, College
d Experiment Station Organization and Equipment.

POULTRY HUSBANDRY.

The Poultry Husbandry Department affords opportunities for instruc-
n in all lines of poultry work, such as the selection, care and manage-
nt, incubating, brooding, judging, breeding, feeding, showing, marketing,
d diseases of various varieties of fowls, ducks, turkeys and geese.

The Poultry Farm of nearly twenty acres upon which the buildings
ve been erected this year offers unexcelled opportunities for practical
struction.

VESTIGATION AND THE REARING OF YOUNG STOCK.

The buildings consist of a large headquarters building, long poultry
use and colony houses for brooders, young stock and breeding stock.
e Headquarters Building contains a large feed room, carpenter shop,
cubator room, killing and marketing room, egg room, and room for
tendants; and is without doubt the best building of its kind in the
untry. The long poultry house, of the cloth curtain type, consists
seven 12x12 pens which, together with the colony houses, have a capaci-

ty of approximately one thousand head of poultry, which is used in lat oratory and investigational work. All pens are equipped with trap nes so that individual egg records may be obtained from each hen. The Ir cubator room is equipped with machines made by several of the lea ing incubator firms and affords opportunity for a complete study of tl different types of incubators. A thorough study of the latest broodir methods is also made.

POSITIONS OPEN TO MEN TRAINED ALONG POULTR HUSBANDRY LINES.

At the present time there is an urgent and increasing demand f College men who possess scientific training in Poultry Husbandry t gether with practical experience and ability. Some of the openings f students trained along these lines are college and Experiment Stati work, managers of utility and fancy poultry farms, poultry journali and poultry judging, managers of poultry supply houses and poult feed departments, superintendents and buyers for poultry fattening est lishments, salesmen with the incubator and brooder manufacturers.

COURSES IN POULTRY HUSBANDRY.

30. **Poultry Judging.** Required first semester Junior year i the Animal Husbandry course, elective, first semester Junior or Senr year in all other Agricultural courses. This course includes a study f the origin, history, and classification of the various breeds and variet, and the scoring, judging and breeding of the most important variet, in accordance with the American Standard of Perfection. Practice ll be given in the study of feather markings, judging and fitting of bi s for show. Three hours credit. Lectures, two hours and 1 two-h r laboratory period per week. Fee, $2.00.

31. **Poultry Management.** Required second semester Junior y r in the Animal Husbandry course, elective second semester Junior r Senior year of all other Agricultural courses. This course include a study of poultry houses, arrangement of buildings and yards, feeds d feeding, judging for market types, incubation, brooding, anatomy of f l and egg, diseases, sanitation, caponizing, killing, dressing and mar t- ing of poultry products. Three hours credit. Lectures two hours d 1 two-hour laboratory period per week. Fee, $2.00.

32. **Practice in Feeding and Management.** Elective first seme er Junior or Senior year in all Agricultural courses and must be acc n- panied or preceded by course 30. The student will be given charg of a pen of fowls and will be required to keep a record of the amo ts and cost of food consumed, gains made, eggs produced and calc te the profit or loss. This work will cover a period of three weeks, nd the student must be present morning, noon and afternoon, time t be arranged by appointment with the instructor. One hour credit. ee. $2.00.

33. **Incubator Practice.** Elective second semester of the Junior Senior year in all Agricultural courses and must be accompanied or eceded by Course 31. Each student will be given charge of one or ore incubators for the period of one hatch and required to keep records fuel consumed, temperatures, infertile eggs, dead germs, dead in shell, icks hatched and reckon the cost of incubation. This course will ver a period of four weeks and the student must be present morning, on and afternoon; time to be arranged by appointment with the in- uctor in charge. One hour credit. Fee, $2.00.

34. **Brooder Practice.** Elective second semester Junior and nior year in all Agricultural courses and must be accompanied or preded by course 31 and preceded by course 33. Each student will be ven charge of chicks in a brooder for four weeks from time of hatch- g and must keep records of temperatures, fuel and foods consumed, ins made, mortality, and calculate the cost of brooding. The student ill be required to be present morning, noon and afternoon; time to be ranged by appointment with instructor. One hour credit. Fee, $2.00.

35 **and 36. Poultry Research and Experimentation.** Elective nior year in all Agricultural courses. Open only to those who have ken courses 30 to 34. This course is intended for those students who ish to fit themselves especially for college and experiment station work Poultry Husbandry. This course will include a report of special re- arch on some poultry topic, a study of the Poultry Husbandry work w being carried on in the experiment stations throughout the country, ethods and technique of breeding from egg production and meat types, rangement of experimental records and data in feeding, breeding, incu- tion and brooding. This course extends throughout the year. Time by pointment. One hour credit each semester. Students electing this urse should also take their thesis in Poultry Husbandry. Fee, $2.00

ONE YEAR POULTRY HUSBANDRY COURSE.

This course is intended for those students who wish to prepare them- lves for practical poultry work and have but one year to devote to udy and practice. The course will consist of courses 30 to 34 inclu- ve, practical work on the Poultry Farm, and reports on especially signed topics. The practical work will consist of five to eight hours ork per day in the caring for poultry, building of colony houses, running incubators and brooders, killing and dressing, mixing of feeds, and ch other work as is ordinarily done on a poultry farm. This gives e student a chance to acquire that skill which comes only from prac- ce.

POST GRADUATE WORK IN POULTRY HUSBANDRY.

Because of the newness and great scope of the field, Poultry Hus- ndry offers many opportunities for doing valuable research work. nexcelled opportunities are offered for the common application of training the student may have received in embryology, bacteriology, physics, zoology, entomology, farm architecture, etc. Some of the lines along which the student may work are:

1. **Breeding.** Because of the shortness of generations and widely varying characteristics in color and shapes of varieties, poultry offers unexcelled opportunities for study of unit characters in crossing and the laws of heredity. Work may be also done along the lines of breeding for meat type and increased egg production.

2. **Feeding.** Comparative studies of different rations for laying and breeding stock, rearing and fattening or finishing. Comparison o breeds in regard to gains made on certain rations. Effect of feeding on color of feathers or composition of flesh and eggs.

3. **Housing.** Comparison of glass front, curtain front or combination glass and curtain front houses. Comparison of large and smal flocks. Study of colony houses, Poultry House Sanitation.

4. **Incubation.** This branch of the industry is in great need o investigation because of its vast importance and the little knowledge w now have of its laws. Such lines of work could be taken up as: Effec of moisture or non-moisture methods on the hatchability of eggs an vitality of chicks; value of carbon dioxide in incubation; study of natura methods; loss in weight in incubation; change in the structure an density of the shell; selection of chicks as they hatch for constitutiona vitality; difference in incubation management for eggs of different classe of poultry.

5. **Brooding and Rearing.** Brooding in large versus small flocks natural versus artificial brooding; study of brooder diseases; effects o temperature on health and growth of chicks.

6. **Poultry Diseases and Pests.** Study of Cholera, sorehead black head, roup and other poultry diseases with a view to preventio and cure. Study of lice, mites, rats and other pests with a view to the extermination.

7. **Comparative Anatomy.** To determine the comparative marke values, distribution of edible meat, textures of flesh and different typ of various breeds.

The many varieties of stock, buildings, incubators, brooders an other equipment on the poultry farm, together with birds shipped in fro all parts of the state, are available for this work.

Graduate Work in Animal Husbandry.

Post graduate work in Animal Husbandry may be taken along a of the following lines:

1. **Animal Nutrition.** Because of the large number of horses, cattl sheep, and swine feeding experiments being conducted on the Colle Farm, the opportunities for doing research work in this line are unequalle

2. **Animal Breeding,** including special work along new and origin lines pertaining to principles underlying Animal Breeding.

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3. **Study of Breeds.** With not only typical specimens, but also, in ost cases, complete breeding herds of almost every recognized breed live stock on the continent, the post graduate student is offered nexcelled opportunity for studying breeds adapted to Iowa conditions.

4. **Stock Judging.** For this work, all the various market types of imals and good representatives of pure breeds are available. These e carefully studied on foot, then slaughtered for a block test and the act percentages and values of various cuts determined.

5. **Practical Management of Stock.** A study and investigation of ethods employed on best managed stock farms and breeding establishents in the United States, Canada, Great Britain, and other countries, us preparing students to manage stock farms.

DEPARTMENT OF HORTICULTURE AND FORESTRY

S. A. BEACH, PROFESSOR.
A. T. ERWIN, ASSOCIATE PROFESSOR.
CHAS. A. SCOTT, ASSOCIATE PROFESSOR IN CHARGE OF FORESTRY.
LAURENZ GREENE, ASSISTANT.
O. J. B. SMITH, ASSISTANT.
GEORGE R. BLISS, EXTENSION WORK.

The department of Horticulture and Forestry with its orchards, lantations of small fruits and vegetables, forest garden, forest area, omological and forestal museum, greenhouses, laboratories and library, ffords excellent opportunities for instruction and research.

A large part of the library of the Department is kept in its offices n Agricultural Hall where it is available to students specializing in this ine of work. Besides a fairly complete collection of publications peraining to horticulture and forestry and files of numerous periodicals t also includes the complete library of Charles Downing containing his original drawings and manuscripts and many rare and valuable works on horticulture and forestry.

About 100 acres of land are now available for horticultural and forestal purposes including a recently added tract of 60 acres which has not yet been developed. Besides this the campus of more than 100 acres affords opportunities for instruction concerning ornamental trees and plants and landscape design.

Orchards ranging in age from two years to fifteen years contain representatives of the hardiest types of cultivated fruits both native and foreign and include over a thousand varieties. Several thousand seedling varieties which have been originated in the work in plant breeding are being tested in the orchards and nurseries. Various methods of stratification, layering, budding, grafting and other operations with plants are given practical illustration in the greenhouses and nurseries. Annual variety tests with leading types of vegetables afford opportunity for study along this line of work.

The past few years have witnessed a wonderful development in the science of Forestry due in large part to the increasing scarcity of timber so necessary in the development of every state and community. Large manufacturers and lumbermen are turning to practical forestry as a means of insuring the permanency of their industries. This is causing an increasing demand for trained men to manage our existing forests, provide for future crops, and reclaim barren non-agricultural lands by tree planting. The Government Forest Service calls for a number of college graduates each year and trains them in scientific forestry work. To meet these numerous demands for men, several colleges and universities including this one, are giving courses of instruction in Forestry.

The questions that are of greatest importance in the development of forestry in Iowa are the formation, care and harvesting of the farm grove and woodlot and the prevention of stream erosion by tree planting, hence special attention is paid to these problems. Although Iowa is classed as a prairie state, yet there are excellent opportunities for the practical study of forestry in many parts of the state. There are several planted groves and considerable timber upon and near the college campus.

The museum of the department contains a large collection of woods native to this country, tropical America and the Philippine Islands which afford the student ample opportunity for becoming acquainted with the structure and gross appearance of the principal commercial timbers on the markets of this country.

HORTICULTURE AND FORESTRY IN WINTER SHORT COURSE

(January 4, 1909, to January 16, 1909).

The Department of Horticulture and Forestry offers work during the winter short course which is designed especially to meet the needs of men who have not the opportunity to take a complete course: Instruction will be given in up-to-date methods of combating insects and diseases of the orchard and garden and in the operation of various kinds of spraying apparatus from hand pumps to gasoline power machines. Other subjects which will be studied are the harvesting and storage of apples, especially the handling of apples in cold storage; varieties best adapted to the various sections of the state both for home use and commercial planting; pruning and other practical topics pertaining to orchard management; propagation of plants including grafting, layering, budding and the growing of cuttings; management of farm woodlots and planted groves; most profitable trees to plant; treatment of posts to prevent decay; and the laying out and ornamental planting of home grounds.

The College campus affords excellent opportunity for studying the different varieties of deciduous trees, evergreens, and other ornamentals. Leading varieties of orchard fruits and potatoes from different sections of the state will be supplied for exhibition and laboratory use.

COURSE IN HORTICULTURE AND FORESTRY

For Freshman year, see Agricultural Courses page 65. All Agri-ultural students will take the same work until the beginning of the ophomore year.

Sophomore Year.

FIRST SEMESTER.

		Required semester hours
Iorticulture 1,	Vegetable and Greenhouse Crops	3
gricultural Engineering 4,	Farm Engineering	4
oils 1,	Soil Physics	5
gricultural Chemistry 21,	Elementary Experimental Chemistry	5
conomic Science 9,	Outlines of Economics	3
Iilitary 3, or Athletics,		
	Total semester hours	20

SECOND SEMESTER.

			Required semester hours
Horticulture 7,	Pomology		2
Horticulture 15,	Silviculture		2
Agricultural Engineering 8,	Spraying Apparatus		1
Zoology 16,	General Zoology		5
Agricultural Chemistry 23,	Elementary Experimental Chemistry		5
English 12,	Argumentation		2
Choice: Economic Science 10,	Agricultural Economics	3	3
History 6,	French Revolution and XIXth Century	3	
Military 4, or Athletics,			
	Total semester hours		20

Junior Year.

FIRST SEMESTER.

			Required semester hours
Choice: Horticulture 5,	Advanced Pomology	3	3
Horticulture 18,	Forest Utilization	3	
Zoology 4,	Entomology	4	4
Agricultural Chemistry 25,	Agricultural Analysis		4
Elective: The student will select from the list of electives on page 111, enough work to make a total of from sixteen to twenty hours per week			5 to 9
	Total semester hours		16 to 20

SECOND SEMESTER.

		Required semester hours
Horticulture 10,	American Horticulture	2
Botany 11,	Vegetable Physiology	4
Botany 15,	Systematic Botany	3
Soils 2,	Soil Fertility	5
		14

Elective:

The student will select from the list of electives on page 111, enough work to make a total of from sixteen to twenty hours per week. 2 to 6

Total semester hours 16 to 20

Senior Year.

FIRST SEMESTER.

		Required semester hours	
Horticulture 8,	Landscape Gardening	3	3
Horticulture 9,	Research Work	2	2
Horticulture 16,	Forest Development and Policy	2	2
Botany 5,	Vegetable Pathology	3	5
		10	12

Elective:

The student will select from the list of electives on page 111, enough work to make a total of from sixteen to twenty hours per week. 6 to 10

Total semester hours 16 to 20

SECOND SEMESTER.

			Required semester hours	
Choice	Botany 24, and	Plant Embryogeny	1	
	Horticulture 4,	Plant Breeding	3	
	Horticulture 17,	Wood Technology		3
	Horticulture 13,	Thesis	2	2
	Botany 40,	General Bacteriology	2	2
			8	7

Elective:

The student will select from the list of electives on page 111, enough work to make a total of from sixteen to twenty hours per week. 9 to 13

Total semester hours 16 to 20

COURSES IN HORTICULTURE

1. **Vegetable and Greenhouse Crops.** Required, first semester ophomore in Horticultural Course, and elective in all other Agricultural urses. The general culture of vegetables in the field and under glass d also other commercial crops grown under glass. Three hours credit. wo lectures and one laboratory.

2. **Plant Propagation.** Required second semester Freshman ear in the Agricultural course. Propagation of plants by sexual and on-sexual methods; germination, testing and storage of seeds, multipliation of plants by cuttage, layerage and graftage, including both greenouse and nursery types. Three hours credit. Recitations, two hours and boratory, two hours per week. Fee, $1.00.

3. **Orcharding.** Required first semester Sophomore year in Anial Husbandry, Agronomy, Dairy and Science and Agriculture courses. he establishment and care of home orchards and vineyards; systematic tudy of varieties adapted for planting in Iowa. Three hours credit. ecitations, two hours and laboratory two hours per week. Fee, $1.00.

4. **Plant Breeding.** Required second semester Senior year in orticulture, Agronomy and Science and Agriculture, elective second emester Junior or Senior year in all other Agricultural courses. Study f the principles of plant breeding and their application to the improveent of plants. Plant Embryogeny, Botany 24, prerequisite or required ith this course. Recitations, three hours per week.

5. **Advanced Pomology.** Required first semester Junior year in orticulture, elective first semester Junior or Senior year in all other gricultural courses. Commercial orcharding; grading, storing and mareting fruit; fruit judging; orchard and nursery technique. Prerequiite, Horticulture 2. Three hours credit. Recitation, one hour and labratory, two hours per week. Fee, $1.00.

7. **Pomology.** Required second semester Sophomore year in orticultural course, and elective Junior or Senior year in all other Agriultural courses. A study of the problems involved in the establishment nd care of orchards. Two hours credit. Two lectures and one labratory. Fee, $1.00.

8. **Landscape Gardening.** Required first semester Senior year in orticulture and Science and Agriculture, elective first semester Junior r Senior year in all other Agricultural courses, and Science courses. A tudy of the principles involved in the planting and decoration of home rounds and parks; ornamentals adapted to planting in Iowa. The ornaental trees and shrubs on the campus and in the department afford exellent material for laboratory work. Three hours credit. Recitations, wo hours and laboratory, two hours per week.

9. **Research Work.** Required first semester Senior year in Horiculture, elective first semester Junior or Senior year in all other Agriultural courses. An independent investigation in some line of work

under the supervision of the head of the department. Two hours credit Two hours per week.

10. **Development of American Horticulture.** Required in the second semester Junior in Horticultural course and elective in all other Agricultural courses. Study of the development of horticulture in America, including the history of our cultivated fruits, the important workers in this field and the literature pertaining to the same. Two hours credit Two hours per week.

11. **Floriculture.** Required first semester Junior year in Domestic Economy, and elective in General Science first semester Junior or Senior year. No course prerequisite. Propagation and general management of house plants and ornamentals for the home grounds. Recitations, two hours per week.

13. **Thesis.** Required second semester Senior year in Horticulture. The subject chosen must be one requiring independent investigation, the results of which are to be presented in a carefully written report May be a continuation of Course 9. Two hours credit.

COURSES IN FORESTRY.

14. **Farm Forestry.** Required first semester Freshman year in all Agricultural courses. Includes life history of a tree; forest influences; distribution of trees in the United States; tree planting in Iowa; growth and care of windbreaks and farm woodlots; structure and uses of common timbers with methods of artificial preservation; classification of trees. Three hours credit. Recitations, two hours and field work, two hours per week. Text, Principles of American Forestry, Green.

15 **Silviculture.** Required second semester Sophomore year in Horticulture, and second semester Junior in Science and Agriculture; elective second semester Junior or Senior year in all Agricultural courses Distribution and character of native forests; factors of tree growth classification and identification of forest trees; collection, storage and germination of seed; species to plant; methods of planting with reference to Iowa conditions; determination of contents of single trees and whole forests; rate of growth and other forest measurements; practical studies of Iowa farm woodlots; valuation of forest crops; methods of reproduction, thinning and final cutting. Two hours credit. Two lectures and two hours field work required in connection with lectures.

16. **Forest Development and Policy.** Required first semester Senior Horticulture and Forestry; elective Junior or Senior in all other Agricultural courses. Attitude of nations toward forestry; development of forestry in the United States; relation of forestry to national reclamation work; protection of forests against natural enemies. Two hours credit.

17. **Wood Technology.** Required of Forestry students; elective second semester Senior year in Mechanical, Civil and Mining Engineering and elective second semester Junior or Senior year in all Agricul-

tural courses. A study of common woods, their structure, identification, use, decay and methods of preservation. Three hours credit. Recitations, two hours and laboratory work, two hours per week.

18. **Forest Utilization.** Required of students specializing in Forestry; elective first semester Junior or Senior year in all Agricultural courses. Study of economic relations of timber to manufacturing industries; conversion of timber into finished products; consumption of timber products; grading of lumber. Prerequisite, Horticulture 15. Three hours credit. Two lectures and two hours field work.

GRADUATE WORK IN HORTICULTURE AND FORESTRY.

Advanced work in Horticulture along the lines indicated in the under-graduate courses is open to properly qualified students. Special facilities are offered for the study of problems bearing upon pomology, the breeding and propagation of plants and the storage of fruits.

In Forestry, opportunity is offered for special investigation of tree planting under prairie condition, including the prevention of erosion and the reclamation of flood damaged lands by tree planting.

SCIENCE AND AGRICULTURE.

The field of Agriculture presents such rapid changes and there is such wide and varied demand for young men combining agricultural and scientific training that it has been deemed advisable to offer a course less technical than the other agricultural courses that relates directly to some special line.

The course in Science and Agriculture is designed to meet the demands of country agricultural high schools and other institutions, public and private, established for the purpose of giving instruction in the general sciences and elementary instruction in agriculture. There will doubtless arise a large demand for strong, broadly educated, well trained teachers for this and other kinds of agricultural instruction in public and preparatory schools where the work is now being introduced.

A new phase of agricultural education has developed in recent years in the various forms of agricultural extension work. This movement is destined to be far reaching in its results and it is clearly one of the most potent influences in the field of agriculture. This phase of agricultural instruction, which is bringing science to the aid of agriculture by reaching the man in the field and on the farm, the children in the public school and the family in the home, is calling for well trained men far in excess of the supply.

COURSE IN SCIENCE AND AGRICULTURE.

For Freshman Year, see Agricultural Courses, page 65. All Agricultural students will take the same work until the beginning of the Sophomore year.

Sophomore Year.

FIRST SEMESTER.

		Required semeste hours
Horticulture 3,	Orcharding	3
Agricultural Engineering 4,	Farm Engineering	4
Agricultural Chemistry 21,	Elementary Experimental Chemistry	5
Economic Science 9,	Outlines of Economics	3
English 12,	Argumentation	2
Military 3, or Athletics		
	Total semester hours	17

SECOND SEMESTER.

			Required semeste hours
Zoology 16,	General Zoology		5
Botany 15,	Systematic Phanerogams		3
Agricultural Chemistry 23,	Elementary Experimental Chemistry		5
Choice: Economic Science 10,	Agricultural Economics	3	3
Choice: History 6,	French Revolution and XIXth Century	3	
Military 4, or Athletics			
	Total semester hours		16

In addition to the above required work, the student will elect enough work to make from 18 to twenty hours per week.

Junior Year.

FIRST SEMESTER.

		Required semeste hours
Zoology 4,	Entomology	4
Agricultural Chemistry 25,	Agricultural Analysis	4
Soils 1,	Soil Physics	5
		13

Elective:

The student will select from the list of electives on page 111, enough work to make a total of from sixteen to twenty hours per week — 3 to 7

Total semester hours — 16 to 20

SECOND SEMESTER.

		Required semester hours
otany 11,	Vegetable Physiology	4
otany 40,	Bacteriology	2
oils 2,	Soil Fertility	5
		11
lective:		
The student will select from the list of electives on page 111, enough work to make a total of from sixteen to twenty hours per week		5 to 9
	Total semester hours	16 to 20

Senior Year.

FIRST SEMESTER.

		Required semester hours	
orticulture 8,	Landscape Gardening	3	3
otany 5,	Vegetable Pathology	3	5
nimal Husbandry 9,	Animal Nutrition and Packing House By-Products	2	2
		8	10
lective:			
The student will select from the list of electives on page 111, enough work to make a total of from sixteen to twenty hours per week		8 to 12	
	Total semester hours	16 to 20	

SECOND SEMESTER.

		Required semester hours
otany 24,	Plant Embryogeny	1
orticulture 4,	Plant Breeding	3
		4
lective:		
The student will select from the list of electives on page 111, enough work to make a total of from sixteen to twenty hours per week		12 to 16
	Total semester hours	16 to 20

DEPARTMENT OF AGRICULTURAL JOURNALISM.

L. E. CARTER, INSTRUCTOR.

Three years ago a chair in Agricultural Journalism was establish at the Iowa State College by the aid of Mr. John Clay, of the firm Clay, Robinson & Co., of Chicago. This was distinctly a new departu in the field of agricultural education. By many agricultural journalis was looked upon as a field of labor of peculiar limitations, a field which excellence could be obtained by heredity, but not by training study. Mr. Clay, who is himself a most forcible writer, combining to remarkable degree a wide range of practical information and a fascina ing style, believed that training would count for something in this, as i all other lines of agricultural work. His address in the Plow and t Book, delivered at Ames, at the inception of this movement has attract wide attention.

The work, though started in a moderate way, has led to highly gra ifying results. It has proven popular with the agricultural student who have learned that there is great benefit to be derived from the stud of this important subject. The graduates who have taken this wor at Ames have given good account of themselves. A student who gra uated a year ago immediately took a position on one of the leading agr cultural papers. At the end of his first year's service his employer w pleased to contract with him for three years' service at a salary of $25 for the third year. A student who graduated this last year accepted similar position on another paper and within a short time was advance to an important editorial position on another paper of wide influenc Other students are being sought even before graduation.

Not all students are qualified for editorial work, but all may be helpe and strengthened by a good course in agricultural journalism, wheth they intend to follow this calling or not.

A man who has employed a number of Ames men for special wor along this line said he had never yet been disappointed in one of the An editor of a prominent agricultural paper after passing on the wor of last year's class, said: "I don't think I need hesitate to say that never got hold of nine articles that showed more uniform excellenc more care in preparation and observance of instruction received in th classroom."

In the Live Stock World reporting contest at the 1906 Internationa Ames men won three out of four first prizes and one-half of the mone offered. In the national Corn Show contest, Ames students won thirty five out of sixty prizes and 68% of the money offered, in competitio with one hundred and fifty contestants from nine states. In the Iow Corn Growers contest, Ames students won first, second, and third prize and all of the money offered. All of these contests were based upo writing on practical subjects, with practical men as judges.

The work in agricultural journalism is proving that this subject ha a place in the curriculum of a modern, well-equipped agricultural colleg

l in the education of the future farmer. The work not only stimu-
es a study of the essentials of agricultural journalism, but it admirably
plements a student's training in English, in clear concise expression,
l his knowledge of general agricultural topics.

1. **Agricultural Journalism.** Elective first semester Junior or
nior year in all Agricultural courses. Includes a study of "The Evolu-
n and Development of the Press, Literary and Mechanic," "Reportorial
d Editorial Work on Daily, Weekly and Monthly Papers," "Preparing
d Offering MSS." "The Field of Agricultural Journalism, its distinctive-
ss and special requirements," "The Agricultural Editor and the Agri-
ltural Writer," "Reporting," "The General and the Special Article,"
n Analytical Study of the Leading Farm Journals," and other closely
ied topics. Articles are assigned to the students twice a month. These
e corrected and criticised from the standpoint of the editorial staff to
ich the student is desirous of submitting his article. The aim of this
urse is to develop a clear, concise and original style of writing on the
pics with which he is most familiar. The best manuscripts are sent to
e leading papers of America and are often accepted and published. One
ur credit.

2. **Agricultural Journalism.** Elective second semester Junior or
enior year in all Agricultural courses. Lectures on "Development of
riginality," "Choice of Subjects, Titles and Words," "Dignity and Ac-
racy," "Timeliness," "Paragraphs," "Leader and Editorial Writing," "Re-
ewing Books, Bulletins and Exchanges," "Free Lance Writing," "Proof
eading," "Illustrations" and "Make-up." Lectures are also given on
Photography, its Principles and Application to Journalism," by Mr. F.
. Colburn, who has had extensive experience in this work. Mr. C. A.
hamel of Chicago has inaugurated a trophy competition whereby the
embers of the class shall write articles on agricultural topics at the
ose of the course. The name of the winner is inscribed on the trophy,
hich becomes his property for a year. Members of this class do special
ork for many of the best farm papers during this term. Editors and
anagers of the leading agricultural journals lecture before the students.
hese talks are invaluable in establishing the students' viewpoint in this
rofession. Prerequisite, Agricultural Journalism 1. One hour credit.

ELECTIVES IN THE AGRICULTURAL COURSES.

**Subjects which may be elected in the Junior or Senior year in any
f the Agricultural courses, provided the student has the prerequisites
or each study chosen.**

Semester	Department and Course Numbers
First	Agricultural Chemistry 27, 40.
Second	Agricultural Chemistry 26, 34.
First	Agricultural Engineering 3, 4, 7.
Second	Agricultural Engineering 5, 6, 8.
First	Agricultural Journalism 1.

Second	Agricultural Journalism 2.
First	Animal Husbandry 9, 11, 21, 30, 32, 35.
Second	Animal Husbandry 7, 12, 31, 33, 34, 36.
First	Botany 4, 5, 6, 10, 13, 19.
Second	Botany 3, 11, 12, 15, 24, 25, 30, 36, 40.
First	Civil Engineering 308,
Second	Civil Engineering 409, 713.
Second	Civics 5.
First	Dairying 14, 17, 18.
Second	Dairying 10, 11, 13, 16, 20, 21, 24.
First	Economic Science 1, 3, 7, 9.
Second	Economic Science 4, 5, 6, 10, 11.
First	English 7.
Second	English 8.
First	Farm Crops 3, 8, 10, 11.
Second	Farm Crops 4, 10, 12.
First	Geology 501, 704.
Second	Geology 2, 805, 6, 607.
First	History 3, 5, 10, 12, 20.
Second	History 4, 5, 6, 9, 11, 20.
First	Horticulture 1, 5, 8, 9, 16, 18.
Second	Horticulture 4, 7, 10, 15, 17.
First	Modern Languages— Language (French) 1, 3. Language (German) 5, 7. Language (Spanish) 30, 32.
Second	Modern Languages— Language (French) 2, 50. Language (German) 6, 26. Language (Spanish) 31, 38.
First	Literature 1, 4, 6, 8.
Second	Literature 2, 3, 7, 10, 11.
First	Mathematics 8, 24, 25.
Second	Mathematics 9, 23, 26.
First	Military 5, 7.
Second	Military 6, 8.
First	Physics, 509. If recommended by the Head of the Department in which the student is taking his major work.
Second	Physics 404.
First	Psychology 1.
Second	Psychology 2, 3.
First	Public Speaking, 3, 5, 10.
Second	Public Speaking 6, 8, 11.
First	Soils 1, 6.
Second	Soils 2, 5, 7, 8.
First	Veterinary 19, 23, 33, 44.

Second	Veterinary 22, 24.
First	Zoology 2, 4, 5, 17.
Second	Zoology 3, 6, 8, 18.

Remunerative and Instructive Labor.

The Agricultural courses afford opportunity to do considerable work n the fields and about the barns and grounds. The compensation for ervices of this kind ranges from eight to fifteen cents per hour according o the merit of the work. Thus students are enabled not only to earn art of their expenses but also to materially strengthen the practical side f their education. A number of the strongest and most capable students re aided in finding employment during vacations with successful stockmen on good farms and in various other positions in line with their chosen work. Some who have taken a year of practical work in this way during their course, have found it of marked benefit and it has enabled them to command more desirable and remunerative positions at the completion of their College course. Too much emphasis cannot be placed on a thorough understanding of the practical application of correct principles of agriculture.

Credits for Practical Work.

Agricultural students who, by previous agreement with the head of the department, do practical work on farms, horticultural or feeding or breeding establishments, beet sugar factories or forestry reservations, of recognized standing, during their course of study will be allowed credits on the following basis: Students who take practical work of the kind described under the direction of the proprietor and render competent and faithful service, will, on their return to College and on the presentation of a concise written report or resume of their observations and experience, be entitled to the following credits in the four year courses in Agriculture:

For three months, five hours of elective work in the Junior or Senior year; for six months, eight hours; and for one year, ten hours; no more than five hours of which shall be credited in any one term of the College course.

Students must have at least six months of practical work before graduation, but credit will be given for such work only as stated above.

Special Courses.

Students desiring courses shorter than the regular four year courses are permitted to take up special courses in accordance with the general regulations governing such work and subject to the approval of the Dean of Agriculture and the President of the College.

Such courses may cover a period of one semester, one year or two years, but special students are advised to take not less than one year's work in any chosen branch and in all cases where practicable or possible to do so, students are urged to complete the four years' course. The results will justify the time and expense required and modern agriculture demands thorough training, special fitness, and a high order of ability. No degrees are granted for less than four years' course.

Department of Agriculture Scholarships.

The State Department of Agriculture offers scholarship prizes of $200.00, $100.00 and $25.00, open to young men of the state not enrolled as a regular or special student in any agricultural college, without barring the students of the special short courses in January. These scholarship prizes are awarded for the best judging live stock and corn annually at the state fair in accordance with the rules and conditions prescribed by the state department of agriculture governing the contest. These afford opportunities for young men to receive substantial aid toward paying the expenses of a college education, and some excellent students have come to the institution by means of these scholarships.

Mr. J. Ogden Armour of Chicago and the Rosenbaum Live Stock Commission Company of Chicago have donated prizes of $5000 and $1000 respectively for competition annually at the International Live Stock Exposition. At the last International the Iowa State College won seven of Armour scholarships of $250 each and $300 of the Rosenbaum prizes. These scholarships are awarded annually to worthy students enrolled in the two weeks short courses and in the regular four year courses.

AGRICULTURAL EXPERIMENT STATION

AGRICULTURAL EXPERIMENT STATION

CHARLES F. CURTISS, DIRECTOR.

W. J. KENNEDY, VICE DIRECTOR.

The investigations of the Experiment Station are intimately related to the college work of instruction, as the problems occupying the attention of the Station are those that have a material bearing on the profit of the farm, and they are also those that are timely and in need of accurate investigation. Whether relating to the field, the feed lot or the laboratory, the aim is to investigate those questions which will have a practical relation to successful agriculture. Originality is made a feature of the work so far as is consistent with useful results, and in all instances the sole object is to throw light on the truth relating to the various principles and practices of the farm. The field work strongly supports the instruction of the College in regard to the varieties of grains and the methods of cultivation, thus enabling the student to become acquainted with the latest ideas relating to these. Tests are made of different varieties of fodders, grasses and grains, also of different systems of culture and various crops.

The experimental investigations with animals embrace a study of the value of different feeds for different features of animal production, the preparation of feeds, systems of feeding, also a study of different types of animals suitable for the requirements of the market. The object sought in this department of Station work is to indicate the manner in which the Iowa farmer through the employment of animals can realize the most from his farm products and add to the fertility of the farm. The Experiment Station has reached out in this way to a remarkable degree, bringing sheep from Mexico, Colorado and Scotland, cattle from Texas and Great Britain, horses from Wyoming, Montana and Europe, in its endeavor to thoroughly study this very important feature of the farmer's work. The data from these experiments is always accessible to the student who has the opportunitiy of observing daily the development of it at every stage.

The work of the Experiment Station is in the closest touch with the Dairy industry. The problems which practical men are constantly confronting and asking aid in solving are at all times objects of experimentation by the Dairy Section. The students not only see but assist in carrying out these experiments. In this way they become acquainted not only with the problems to be solved but with the methods employed in the investigations. This experimental work relates to the various problems of both butter and cheese making. The results of this work together with those of the bacteriological investigations are daily used in class work.

The experimental work in Horticulture also affords the student
opportunity to study the results of the theory of the class room as
cticed in the field. The connection of the Department of Horticulture
h the State Horticultural Society is such that problems touching the
nmercial side of fruit growing receive the closest attention. Experi-
nts are conducted in spraying for the prevention of fungus pests and
urious insects; also in fertilizing, pruning, and thinning; in nursery
rk and in plant breeding. The Station work thus equips the student
th the practice and technique necessary to a thorough horticultural
ining.

The work of the Experiment Station has been increased by the addi-
n of Forestry as a line of investigation. Methods of practical treat-
ent of fence posts and other timbers to increase durability are being
termined in coöperation with the United States Forest Service and
rmers and stock men throughout the state. The adaptability of various
ees for different sections of the state and methods of germination and
orage are being tested. To get more definite data in reference to
ermination of seed and growth of seedlings in nursery rows, tree seed
as been distributed to farmers in twenty-five counties of the state.

A 200 acre dairy farm is being stocked and equipped for experimental
nd educational work in this important line of work. This farm and its
quipment will afford excellent facilities for experimental work in the
arm production side of the dairy industry. A poultry department is
lso being added for experimental and instruction work.

AGRICULTURAL EXTENSION DEPARTMENT

AGRICULTURAL EXTENSION DEPARTMENT

P. G. HOLDEN, SUPERINTENDENT.

The Agricultural Extension work was established permanently b enactment of the Thirty-first General Assembly of Iowa. This a provided for giving lectures and demonstrations on the growing of cro and fruits, on stock raising, dairying, land drainage and kindred su jects, including Domestic Science. Specific mention was made in th act of instruction in corn and stock judging at agricultural fairs, inst tutes and clubs and aid in conducting Short Courses of instruction a suitable places throughout the state.

Under this act the Extension Department has been organized by th Board of Trustees of the college, as a department of the Division o Agriculture.

The demand for the extension work was the natural outgrowth o the experimental and instruction work which has been carried on at th college by the heads of the departments in the Division of Agricultur It was deemed best to separate it from the instruction and experimenta work of the college and employ a special staff for the extension work to avoid interference with the duties of the heads of departments i conducting the college work. There is necessarily a close relation between all of the heads of departments and the extension work in corresponding lines. The Extension Department by action of the Boar of Trustees sustains the same relation to the Division of Agricultur and to the college as a whole, as the other agricultural departments though this work is confined entirely to instruction and demonstrations given in various parts of the state remote from the college, with the exception of such assistance as members of that staff have rendered in connection with the two weeks Short Course held annually at the college in January.

The extension work has met with general favor and been in wide demand. Last year 1750 calls were received at the college for work of this kind, of which the Extension Department was able to fill 638.

Demonstration work was carried on at ten county farms. 130 corn judging and fourteen stock judging contests were conducted. During the past year Short Courses have been held at Newton, Mt. Pleasant, Red Oak, Avoca, Cedar Rapids, Spencer, Storm Lake, Manchester, Marshalltown, New Providence and Indianola.

DIVISION OF VETERINARY MEDICINE

DIVISION OF VETERINARY MEDICINE

JOHN H. MC NEIL, DEAN AND PROFESSOR.
R. R. DYKSTRA, ASSOCIATE PROFESSOR.
C. H. STANGE, ASSISTANT PROFESSOR.
WM. E. MADSON, ASSISTANT PROFESSOR.
W. E. HARRIMAN, PROFESSOR.
M. STALKER AND GEORGE JUDISCH, LECTURERS.

The Division of Veterinary Medicine offers a four year course nine months each. The former curriculum has been revised and e larged and a course in stock judging and animal nutrition from the d partment of Animal Husbandry added. This new and longer course h met with general approval as is shown by the increased attendance face of the advanced entrance requirements and increased length course of study.

The Veterinary Division occupies the third floor of Agricultur Hall, where offices, lecture rooms and museums are located. The Ve erinary hospital is a substantial three story brick building, fitted wi commodious, well lighted single and box stalls, operating rooms, offi and pharmacy, resident surgeon's room, dissecting room, an elevat for the accommodation of the patients unable to use the runway second floor, and is furnished with all the surgical instruments of mode construction, operating table and other important conveniences for ho pital work. A number of fine grass paddocks directly adjacent to th hospital are used for such patients as are likely to be benefitted by ou door exercise and a grass diet in the season.

The Veterinary Hospital and the daily free clinics furnish an abu dance of material for practical work. Situated in an extensive stoc growing district, the College is especially favored in this respect, n only horses, but all species of animals, being brought to the hospit for treatment. Senior students are assigned cases for diagnosis an treatment under the supervision of the clinical professor, thus havin an opportunity to apply the theoretical knowledge obtained in the clas room. During the course opportunity is offered to witness all the differ ent operations performed in veterinary surgery, together with the meth ods of treating the different internal diseases. Junior students are de tailed in alphabetical order to assist the pharmacist in the compoundin of prescriptions, in this way becoming familiar with the various forms i which medicines are administered.

Specially equipped laboratories afford excellent opportunity for th study of anatomy, pharmacy, bacteriology, histology, pathology, and th related sciences.

A laboratory intended for the purpose of bacteriological and patho-ogical investigation of the diseases of domestic animals has recently e equipped as a part of the Experiment Station. It is supplied with h most modern biological apparatus, such as high power microscopes, n bators, hot air and steam sterilizers, microtomes, stains, gas, water electric light, and in fact all first class facilities for scientific inves-ition. Specimens are received frequently for examination.

Students also have the advantages of a very extensive library where ss may be had at all times to such journals, magazines, experiment tion bulletins, and other literature as they may desire for reference heir study. The Veterinary Division occupies the third floor of Agri-ural Hall where offices, lecture rooms and museum are located. College being located in a rich stock growing section of the ntry, is supplied with an abundance of clinical material for daily nonstration at the hospital.

Aside from the facilities which belong especially to the Veterinary ision, the equipment for instruction in Animal Husbandry, consisting large flocks and herds of carefully selected breeds of live stock helps render practical instruction very efficient.

The work in Botany, Chemistry, Zoology and other related sciences adequately provided for in the special buildings for the accommodation these several departments of college work.

Requirements for Admission.

Candidates having a college degree, diploma from an accredited h school or those who have passed successfully the matriculate exam-tion of a recognized college will be admitted without examination.

Graduates from recognized schools of Veterinary Science, Agricul-e, Medicine, Dentistry, or Pharmacy will be given credit for work rtaining to the course, upon the presentation to the faculty of satis-tory standing or upon passing an entrance examination.

Examinations and Degree

Examinations are held at the close of each semester upon the work ssed over during that semester. At the end of each year the final ex-inations are held. Students must have passed examinations in all erequisite work of a given semester or year before they can proceed h the work of the succeeding semester or year. These examinations controlled by the faculty rules. At the close of the course after ssing a satisfactory examination, the student receives the degree of ctor of Veterinary Medicine (D. V. M.).

Candidates for graduation must be twenty-one years of age, of good racter and must have passed examinations in all the required subjects the course.

Field Open to Qualified Veterinarians.

The student having completed the course of instruction outlin in this curriculum becomes a veterinarian in the broadest sense a competent to enter a wide field of usefulness by any of the aven enumerated.

A.—General Practice.—In view of the fact that the National li stock valuation is estimated at $3,200,000,000, it becomes obvious t the graduate possessing fitness and aptitude for this kind of work w meet with a ready demand and substantial compensation for his servic

B.—Bureau of Animal Industry.—Veterinarians are in demand f inspection work in the Bureau of Animal Industry, United States D partment of Agriculture, at salaries ranging from $1,400.00 to $2,500.

C.—Army.—The Veterinarians in the United States Army n have a position similar to that of a commissioned officer. The salary $1,500.00 per year with a ten per cent increase for each five years' servi up to twenty years with the same allowances as a second lieutenant cavalry.

These positions are most desirable and with our insular possessio give opportunities for wide experience in professional work.

D.—Animal Husbandry. Qualified veterinarians are called up to act as counsel to the breeder and as guardians to the vast live sto industry of the nation.

E.—Municipal and State Veterinarians.

F.—Veterinarians to stock farms and corporation stables.

G.—Veterinarians to Experiment Stations and Instructors in Ve erinary Colleges.

COURSE IN VETERINARY MEDICINE.

Freshman Year.

FIRST SEMESTER.

Veterinary 1	Comparative Anatomy, 3
Veterinary 6	Dissection, 6
Veterinary 25	Pharmacy, 3 (One laboratory period)
Botany 9	Structural Botany, 3 (One laboratory period)
Chemistry 1	Elementary Inorganic Chemistry, 3 (One laboratory period)
Animal Husbandry 11	Feeding and Management of Live Stock, (One laboratory period)
Military 1	Military Drill

SECOND SEMESTER.

terinary 2	Comparative Anatomy, 3
terinary 7	Dissection, 6
terinary 22	Comparative Physiology, 2
tany 16	Poisonous Plants, 2 (One laboratory period)
emistry 4	General Chemistry, 3 (One laboratory period)
nimal Husbandry 12	Feeding and Management of Live Stock, 2
ilitary 2	Military Drill

Sophomore Year.

FIRST SEMESTER.

eterinary 3	Comparative Anatomy, 3
eterinary 8	Dissection, 6
Veterinary 23	Comparative Physiology, 2
Veterinary 54	Physical Diagnosis, 2
Veterinary 27	Materia Medica, 2
Veterinary 33	Histology, 3 (One laboratory period)
Animal Husbandry 1	Market Types of Cattle and Sheep, 2 (Two judging periods)
Zoology 15	General and Vertebrate Zoology, 5 (Two laboratory periods)
Chemistry 10	Elementary Organic Chemistry, 2
Military 3	Military Drill, 3, or Athletics

SECOND SEMESTER.

Veterinary 4	Comparative Anatomy, 3
Veterinary 9	Dissection, 6
Veterinary 24	Comparative Physiology, 2
Veterinary 34	Histology, 3 (One laboratory period)
Veterinary 16	Horse Shoeing, 2
Animal Husbandry 2	Market Types of Dairy Cattle, Horses and Swine, 2 (Two judging periods)
Chemistry 13	Physiological Chemistry, 3 (One laboratory period)
Military 4	Military Drill, or Athletics

Junior Year.

FIRST SEMESTER.

Veterinary 40	Theory and Practice of Medicine, 3
Veterinary 10	Principles and Practice of Surgery, 3
Veterinary 35	General Pathology, 3 (One laboratory period)
Veterinary 50	Clinics, 6
Animal Husbandry 3	Breed Types of Cattle and Sheep, 4 (Two lectures and two judging periods
Animal Husbandry 20	Animal Feeding, 2
Zoology 5	Embryology, 3 (One laboratory period)
Botany 31,	Bacteriology of the Pathogenes, 2 (One laboratory period)

SECOND SEMESTER.

Veterinary 41	Theory and Practice of Medicine, 3
Veterinary 11	Principles and Practice of Surgery, 3
Veterinary 36	General Pathology, 3 (One laboratory period)
Veterinary 51	Clinics, 6
Veterinary 30	Therapeutics, 2
Animal Husbandry 4	Breed Types of Dairy Cattle, Horses and Swine, 4 (Two lectures and two judging periods)
Animal Husbandry 8	Animal Breeding, 2
Zoology 8	Animal Parasites, 3 (One laboratory period)
Dairying 13	Milk Testing and Milk Inspection, 2 (One laboratory period)

Senior Year.

FIRST SEMESTER.

Veterinary 42	Theory and Practice of Medicine, 3
Veterinary 12	Principles and Practice of Surgery, 3
Veterinary 27	Special Pathology, 3
Veterinary 52	Clinics, 6
Veterinary 32	Therapeutics, 2
Veterinary 14	Operative Surgery, 5
Veterinary 44	Sanitary Science, 2
Veterinary 19	Obstetrics, 1
Veterinary 39	Meat Inspection, 2

SECOND SEMESTER.

terinary 43	Theory and Practice of Medicine, 3
terinary 13	Principles and Practice of Surgery, 3
terinary 38	Special Pathology, 3
terinary 53	Clinics, 6
terinary 15	Operative Surgery, 5
terinary 45	Sanitary Science, 2
terinary 20	Obstetrics, 1
eterinary 47	Hippology, 2
eterinary 18	Conformation and Soundness, 2
eterinary 48	Jurisprudence, 1
eterinary 49	Ophthalmology, 1

COURSES IN VETERINARY MEDICINE.

Comparative Anatomy.

DR. DYKSTRA.

1. **Comparative Anatomy.** Required first semester Freshman year in Veterinary course. Three lectures per week.

2. **Comparative Anatomy.** Required second semester Freshman year in Veterinary course. Three lectures per week.

3. **Comparative Anatomy.** Required first semester Sophomore year in Veterinary course. Three lectures per week.

4. **Comparative Anatomy.** Required second semester Sophomore year in Veterinary course. Three lectures per week.

6, 7, 8 and 9. **Dissection.** Required throughout the Freshman and Sophomore years in Veterinary course. Six hours per week.

The courses in Comparative Anatomy include both Descriptive and Comparative Anatomy. Descriptive Anatomy includes the study of bones, articulations, muscles, circulatory apparatus, and special sense organs. This work is given by lectures supplemented by demonstrations from mounted skeletons, prepared specimens, charts and an Auzoux clastic model.

Practical Anatomy includes a course in dissection. During each year the student makes two complete dissections of the horse and such parts of other animals as is deemed necessary. The first year's work is devoted to the study of bones, articulations and muscles; the second, to special dissection of the nervous system, circulatory apparatus, lymphatic glands, organs of special sense and the organs contained in the abdominal and thoracic cavities. Each student must properly dissect and pass an examination on the part assigned before starting the dissection and study of another part.

Principles and Practice of Surgery.

DR. MC NEIL.

10. Principles and Practice of Surgery. Required first semeste Junior year in Veterinary course. Three lectures per week.

11. Principles and Practice of Surgery. Required second semester Junior year in Veterinary course. Three lectures per week.

12. Principles and Practice of Surgery. Required first semeste Senior year in Veterinary course. Three lectures per week.

13. Principles and Practice of Surgery. Required second semester Senior year in Veterinary course. Three lectures per week.

General Surgery includes Surgical bacteriology, the pathology an treatment of inflammation, diseases of the bones, nerves, muscles, articulations, tendons, tendon sheaths and bursæ; methods of amputation and exarticulation, suturing and the general treatment of wounds; methods o anæsthesia; intravenous, and sub-cutaneous injections; castration; methods of restraint in securing animals, and methods of actual cautery.

Special Surgery includes the surgical diseases of the head, neck thorax, abdomen, urino-genital organs, fore-limb, hind-limb, vertebrae pelvis, stomach and bowels.

Operative Surgery.

14. Operative Surgery. Required first semester Senior year in Veterinary course. Students perform all the operations necessary in veterinary practice. Five hours per week. Fee, $10.00.

15 Operative Surgery. Required second semester Senior year in Veterinary course. Continuation of course 14. Five hours per week.

Horse Shoeing.

16. Horse Shoeing. Required second semester Sophomore year in Veterinary course and second semester Senior year in Animal Husbandry course. Study of anatomy and physiology of foot, relation between form of foot and direction of limb, variation in flight of limb, style of going, shoeing of normal and irregular feet, winter shoeing, hoof nature, correction of defects in gait, and the methods of shoeing hoofs defective in form or diseased. Two lectures per week.

Conformation and Soundness.

18. Conformation and Soundness. Required second semester Senior year in Veterinary and Animal Husbandry courses. Study of conformation of horse with special reference to defects which exist and predispose to pathological changes causing unsoundness, comparison of normal and diseased parts, and a systematic classification arranged to conform to parts involved. Lectures and practical demonstration upon the animal. Two lectures per week.

Obstetrics.

DR. DYKSTRA.

9. **Obstetrics.** Required first semester Senior year in Veterin- and Animal Husbandry courses, and elective in Junior or Senior of all other Agricultural courses. Consists of physiological obstet- ovulation, oestrum, fecundation, sterility, gestation, and hygiene regnant animals, and parturition. Prerequisite, Zoology 5. One re per week.

0. **Obstetrics.** Required second semester Senior year in Veter- course. Consists of pathological obstetrics; the diseases and acci- of pregnancy, dystokia, obstetrical operations, the sequelæ of par- on, and diseases of the young animal. One lecture per week.

Comparative Physiology.

DR. MADSON.

22. **Comparative Physiology.** Required second semester Fresh- year in Veterinary and elective second semester Junior or Senior in all Agricultural courses. A study of general physiology, deal- with the animal cell, the unit of organization, its origin, modification orm and structure, chemical constitution and the various chemical physical laws which effect its nutrition, growth, reproduction and lopment. Two lectures per week.

23. **Comparative Physiology.** Required first semester Sopho- year in Veterinary, and elective first semester Junior or Senior in all Agricultural courses. Deals with special functions of var- organs and tissues of the body. Two lectures per week.

24. **Comparative Physiology.** Required second semester Sopho- year in Veterinary and elective second semester Junior or Senior in all Agricultural courses. Continuation of course 23. Lectures, hours per week.

Physiology is taught by comparing vital phenomena of domestic ani- with those of human beings. In all these courses, F. Smith's Manual eterinary Physiology is used as a text.

Pharmacy.

MR. JUDISCH.

25. **Pharmacy.** Required first semester Freshman year in Veter- y course. A study of all official drugs and preparations. Special ntion is paid to practical pharmaceutical problems and manipulations, to the principles and practical work in compounding prescriptions. h student is required to prepare at least one of each class of official aration. Credit three hours. Lectures, two hours, and laboratory, e hours per week. Fee, $2.00.

Materia Medica.

DR. STANGE.

27. **Materia Medica.** Required first semester of Sophomore y
in Veterinary course. This course is introduced by definitions and a
cussion of composition of drugs, classification of official preparat
incompatibilities and classification of all drugs employed in the prac
of Veterinary Therapeutics. Following this, each drug is taken up
order of its classification and discussed in general detail. Lectu
two hours per week.

Therapeutics.

DR. STANGE.

30. **Therapeutics.** Required second semester Junior year in V
erinary course. Same classification of drugs is used as in course
A study of modes of action of drugs, the physiological laws goverr
the same, the absorption, elimination and methods of administration,
age, idiosyncrasy; also the physiological and therapeutic actions, ind
tions and contra-indications, toxicology and treatment, modes of
ministration and dose of each therapeutic agent. Two lectures per w

32. **Therapeutics.** Required first semester Senior year in Ve
inary course. Continuation of course 30. Reference, Winslow's "
erinary Materia Medica and Therapeutics" and other standard wo
Two lectures per week.

Histology.

DR. STANGE.

Histology proper is preceded by a short course in Microscopy.
is designed to give the student a working knowledge of the micros
and microscopical methods, thus fitting him to study, to best advan
the minute structure of tissues and organs.

33. **Histology.** Required first semester Sophomore year in
erinary course, and elective first semester Junior year in Science
Junior or Senior year in all Agricultural courses. Treats of the
as a unit of structure, of its functions, the tissues, their classification
characteristics. Credit, three hours. Recitations, two hours and lab
tory, three hours per week. Fee, $2.00.

34. **Histology.** Required second semester Sophomore year
Veterinary course. Treats of the tissues in their relation to the struc
of organs. Credit three hours. Recitations, two hours and laborat
three hours per week.

Pathology.

DR. STANGE.

35. **General Pathology.** Required first semester Junior yea
Veterinary course. Treats of causes of disease, its spread and

zation, protecting and healing forces, disturbances of circulation, grade disturbances of nutrition, and infiltration, hypertrophy and neration, inflammation and tumors; also the methods of preparation preservation of gross specimens, preparation of sections for micro- ic study, general technique of laboratory diagnosis. The student ien given preparations for the study of the various pathological phe- ena as considered in class room. Recitations, two hours and lab- ory, three hours per week. Fee, $2.00.

36. **General Pathology.** Required second semester Junior year eterinary course. Continuation of course 35. Recitations, two hours laboratory, three hours per week.

37. **Special Pathology.** Required first semester Senior year in erinary course. Treats of the etiology and morbid anatomy of dis- s caused by streptococci, bacilli, higher fungi, protozoa, animal par- es, and those infectious diseases, the specific cause of which is not determined. Recitations, three hours per week.

38. **Special Pathology.** Required second semester Senior year in erinary course. Continuation of course 37. Recitations, three hours week.

Meat Inspection.

DR. MADSON.

39. **Meat Inspection.** Required first semester of Senior year in erinary course. Includes the physical characteristics of normal flesh organs; methods of slaughter; principles of refrigeration and pre- vation; effect of accidental and pathological conditions on the pre- vation and edibility of meats; putrefaction of meats and consequences ingestion of such meats by man; effects upon the meat of various con- utional and infectious diseases; transmissibility of disease to man and cts of cooking on transmissibility; and the meat inspection laws of the ited States. Two lectures per week.

Theory and Practice of Veterinary Medicine.

DR. MC NEIL.

40. **Theory and Practice of Veterinary Medicine.** Required first nester Junior year in Veterinary course. Includes work on conges- n, inflammation and fever, diseases of the respiratory system, cir- atory system, blood and lymph, digestive apparatus, nervous system, iito-urinary system, eye and skin, and the non-infectious constitu- nal diseases. Three lectures per week supplemented by practice in ly clinics.

41. **Theory and Practice of Veterinary Medicine.** Required sec- id semester Junior year in Veterinary course. Continuation of course Three lectures per week.

42. Theory and Practice of Veterinary Medicine. Required firs semester Senior year in Veterinary course. Continuation of Cours 40 and 41. Three lectures per week.

43. Theory and Practice of Veterinary Medicine. Required se ond semester of Senior year in Veterinary course. Devoted to histor etiology, symptoms, lesions, differential diagnosis and treatment of th various diseases caused by animal parasites; also a review of the morph logical and cultural characteristics of the specific organisms in connecti with the symptoms and lesions which they produce. Three lectur per week.

Sanitary Science.

DR. MADSON.

44. Sanitary Science. Required first semester Senior year Veterinary and Animal Husbandry and Dairy courses. Consists of a co sideration of health and disease; the etiology of disease, predisposing a exciting; means and manner of propagation and transmission of infe tious diseases; general hygiene and stable sanitation, including ve tilation, drainage, selection of site and materials for construction. Tw lectures per week.

45. Sanitary Science. Required second semester Senior year Veterinary course. A consideration of practical methods of disinfe tion, disinfecting agents both chemical and physical, methods of dippi and dips, principles of serum therapy, vaccination and quarantine; al sanitary police of the individual infectious and parasitic animal diseas Two lectures per week.

Hippology.

47. Hippology. Required second semester Senior year in Vete inary course. How to maintain the health and strength of the hor including the framework of the horse from a mechanical standpoi bits and bitting, saddling, draft and harness; care of animals in garris and in field, including watering, feeding and grooming. Two lectu per week.

Jurisprudence.

48. Jurisprudence. Required second semester Senior year Veterinary course. Consists of a study of rights and duties of the vet inary practitioner and of the owner of domestic animals; contracts a sales as applied to dealings in live stock; and the subject of exp testimony. One lecture per week.

Ophthalmology.

DR. HARRIMAN.

49. Ophthalmology. Required second semester Senior year Veterinary course. Methods of examination and diagnosis in particul s well as general principles and special forms of treatment. One lecture week supplemented by demonstrations upon cases and models.

Clinics.

DRS. MC NEIL, DYKSTRA AND MADSON.

50, 51, 52, and 53. Clinics. Required throughout the Junior and Senior years in Veterinary course. The practical work afforded by the clinics gives the student an opportunity to put his knowledge into practi and to acquire the aptitude requisite for his professional work. The clinics are held at the hospital every day from 1 to 3 o'clock P. M. The cases brought to the hospital for treatment are assigned to the senior students who are required to prepare a full report of their examination, diagnosis, and proposed treatment, which are then graded by the clinician when he examines the case. The hospital cases are also treated and reported on by the senior students. The clinical professor, when examining a case, performing an operation, or administering internal treatment, discusses the various aspects of the case, thus giving the utmost good to the student. The junior students assist the seniors in their clinical and hospital work. The large number of animals of a species brought to the hospital afford the student an opportunity to acquire a familiarity with their treatment such as will enable them to give good service to clients immediately upon entrance into practice. Six hours per week during each semester.

Physical Diagnosis.

54. Physical Diagnosis. Required first semester Sophomore year in Veterinary course. Arts and methods of diagnosis first considered, then general examination of different apparatuses of the animal body, and finally specific examinations, including experimental inoculations as a means of diagnosis. Two lectures per week.

Anatomy of Domestic Animals.

DR. DYKSTRA.

55. Anatomy of Domestic Animals. Required first semester, eshman year in all Agricultural courses. Two hours credit.

TEXT AND REFERENCE BOOKS.

ictionary.—Dorland and Gould.

natomy.—Chauveau's "Anatomy of the Domesticated Animals," McFadyean's "Comparative Anatomy," Strangeway's "Veterinary Anatomy," McFadyean's "Dissection Guide," Schmaltz's "Atlas der Anatomie de Pferdes."

Physiology.—F. Smith's "A Manual of Veterinary Physiology," "American Text Book of Physiology."

Histology. — Szymonowiez - MacCullum. Böhm - Davidoff - Huber. Stöhr's.

Materia Medica.—"United States Dispensatory."

Pharmacy.—Remington's "Practice of Pharmacy."

Chemistry.—Bennett's "General Chemistry and Qualitative Analysis," Remsen's "Organic Chemistry," Bunge's "Physiological Chemistry."

Botany.—Atkinson's "Elementary Botany."

Therapeutics.—Winslow's "Veterinary Materia Medica and Therapeutics," "Arzneimittellehre für Tierärzte," by Fröhner, Veterinary Medicine, Dun.

General Pathology.—McFarland, Zeigler, Stengel. Comparative General Pathology, by Kitt.

Special Pathology.—Moore, Hayes' Translation of "Infective Diseases of Animals," by Friedberger and Fröhner. Specielle Pathologie und Therapie der Haustiere by Hutyra and Marck.

Zoology.—Comstock and Kellogg's "Elements of Insect Anatomy," for beginners; none for advanced work.

Bacteriology.—Muir and Ritchie's "Manual of Bacteriology."

Animal Husbandry.—Craig's "Judging Live Stock."

Surgery.—Dollar's. Volume I., Operative Technique.
Dollar's. Volume II., General Surgery.
Dollar's. Volume III., Regional Surgery.
William's Surgical Operations.

Medicine.—Law's "Veterinary Medicine," Hayes' Translation of "Infective Diseases of Animals," by Friedberger and Fröhner.

Animal Husbandry.—Shaw's "Animal Breeding."

Animal Breeding.—Davenport's.

Embryology.—Foster and Balfour's "The Elements of Embryology." "An Introduction to Vertebrate Zoology," A. M. Reese.

Horseshoeing.—"A Text Book of Horseshoeing," by Lungwitz, translated by Adams. "Handbook of Horseshoeing," by Dollar.

Milk Inspection.—Farrington and Woll.

Obstetrics.—Fleming's "Veterinary Obstetrics," Bourney, "Obstetrique Veterinaire," Dalrymple's "Veterinary Obstetrics," De Bruin's "Bovine Obstetrics," translated by Wyman.

Animal Nutrition.—Jordan's "The Feeding of Animals," Henry' "Feeds and Feeding," Armsby's "Principles of Nutrition."

Conformation and Soundness.—Goubaux and Barrier's "Exterior of the Horse," translated by Harger; Hayes' "Points of the Horse."

DIVISION OF ENGINEERING

DIVISION OF ENGINEERING

A. MARSTON, DEAN,
Professor of Civil Engineering.

S. W. BEYER, VICE DEAN,
Professor of Mining Engineering and Geology.

L. B. SPINNEY,
Professor of Electrical Engineering and Physics.

W. H. MEEKER,
Professor of Mechanical Engineering.

The work of the Division of Engineering of the College is apportioned among four departments, viz.:

The Department of Mechanical Engineering.

The Department of Civil Engineering.

The Department of Electrical Engineering.

The Department of Mining Engineering.

Through these departments the College offers systematic four yea courses in Mechanical Engineering, Civil Engineering, Electrical Engineering, Mining Engineering, and Ceramics, also two year courses in Mining Engineering and Clay Working.

NEW COURSE IN CERAMICS.

At the instance of the Iowa Brick and Tile Manufacturers' Association, and of the Association of Iowa Cement Users, the legislature recen ly passed a law establishing instruction and experimentation along thes lines at the State College.

In obedience to the law a four year course of study in Ceramics published in this catalogue, and the proper facilities for instruction an experimentation in the lines of cement and clay products have bee provided.

Iowa has great undeveloped resources in these lines which offer a inviting and remunerative field for professional work. We already hav calls from the largest cement company in the United States for graduates to take remunerative positions, and many excellent opportunitie offer in the clay industries.

The Engineering Courses.

The several courses are planned with a view to fitting those pursuing them to enter professional engineering work and to advance therei more rapidly than would be possible without the preparation furnishe n College course. Experience shows that the graduates from tech- il schools generally excel in their chosen lines and it is worthy of in this connection that railroads, manufacturers and other corpor- ns, as well as municipalities and government departments, are de- ding that those who seek promotion in their technical departments l have secured a technical training such as can now be obtained in engineering schools of the country.

It is very manifest, because of the lack of time in the course, the tiplicity of general subjects which must be emphasized and the lack niformity of details in the profession due to the local and personal erences which exist in the conduct of engineering work of all kinds no college course in engineering can give to a student training experience in all the details of his profession. Moreover it seldem pens that a student in college knows definitely what specific branch is chosen profession he will follow and it would be folly for him to nd his time on details which he may never use. A thorough educa- in the branches of pure and applied science which are related to fessional work is essential. Having this, the engineer readily ac- es familiarity with the details of his work. Without it no amount experiment with details alone can give an engineer high rank in profession.

Therefore it is believed that a college course in engineering should in the first place a training of the mind of the student toward ability think logically, to observe accurately and by the application of the mer acquirement to the latter to reach correct inferences; in the ond place such a course should acquaint the student with approved hods of draughting and computing, with the use and limits of the ruments employed in the every day work of his profession, and uld give him an opportunity for experimental work bearing upon ineering problems; in the third place such a course should provide t the student acquire the art of expressing himself, publicly and vately, in good English and should furnish him with some knowledge the history of his own and preceding times, thus equipping him to be ornament to his profession, and an enlightened member of society.

In accordance with the views above expressed the engineering rses of this college include a variety of studies. These may be con- iently grouped as culture studies, training or disciplinary studies, fessional studies, and practical work.

The culture studies include History, English, Modern Language, nomic Science and Civics. Thorough work in English is especially essary in the training of the engineer to enable him to express him- with the utmost clearness and conciseness, in his reports and in ers on technical subjects. No one can attain great success as an ineer who fails in these particulars. His success in carrying out jects upon which he is engaged will often depend upon his ability convince his superiors or public officials of the correctness of his ws. The really successful engineer must also come in close contact with other members of his profession, and must exchange information of value with them through the medium of papers on technical subjects For the attainment of these ends the engineer should give especial attention to the thoroughness of his training in English. Modern language, either French, German, or Spanish not only gives access to the technical foreign literature but also aids the work in English. History, economic science, and civics cultivate interest in mankind at large and are thus broadening to the student.

The training studies include three years of Mathematics and two o three years of Physics, the very backbone of engineering and of th training of the engineer because by their study are secured habits o logical thinking and a knowledge of the fundamental principles o matter—the laws of nature; also one or more years work in Chemistr where the habits of observing and recording facts are thoroughly instilled.

Considerable time in the Junior and Senior Years is given by all engineering students to work having practical bearing on their profession the object being to correlate, in some measure, theory and practice.

Draughting, shop work and field work are begun upon entrance an continued in proper proportions throughout the several courses. B their means students are frequently able to obtain valuable practical experience during their vacations and are thereby, in turn, benefited b being able to see the usefulness of their college work more clearly tha before.

By such vacation work the student is placed in a measure, in th position of the so-called practical engineer, who, if he be honest wit himself, wishes for the advantages of a technical education.

In the professional studies the student, through his teachers, te books, and actual practice gets into touch with the problems whic the engineers of the day are trying to solve, and thus learns to appr ciate the difficulties which confront them.

The professional and practical studies culminate in the graduatio thesis in which the student is expected to show energy, determinatio resourcefulness and discrimination in the solving of a problem whos solution will add something to the store of engineering knowledge.

A certain amount of undergraduate work and a large amount o graduate work as well as the research work carried on by the individu members of the engineering faculty is devoted to the various industri interests of the state.

Advanced students are given an opportunity to assist in all researc or commercial work which is being conducted by the engineering d partments.

Improvement of Engineering Courses.

Thorough revision and improvement of the engineering cours have just been completed, Junior and Senior years of the improv courses are published in this catalogue for the first time. Many improv nts and advances are being introduced, which will have the effect of ll further advancing the standards of the engineering courses.

Demand for I. S. C. Engineering Graduates.

The engineering graduates of the college are scattered in remunera- te and most responsible positions over the entire world. The demand r them is, in normal times, constantly greater than the supply. Many the seniors are engaged long anterior to commencement.

The graduates are scattered from Panama to Alaska, and from New rk to the Philippines, with large representation at the principal nters of engineering work.

The George W. Catt Engineering Library.

A signal example of the loyalty to the college of its engineering aduates has been presented in the bequests to the college by Mr. George . Catt, C. E. '82, President of the Atlantic, Gulf and Pacific Dredging ., who on his death bequeathed to his Alma Mater his extensive engin- ring and economic libraries and one-half of his large fortune.

The engineering library has been placed in Engineering Hall, in njunction with the engineering books and periodicals from the general llege library, and thus through Mr. Catt's devotion, the engineering udents are afforded free access to the best engineering literature. Ex- nsive use of these library privileges is strongly urged on all engineer- g students. Only by extensive technical reading, especially of the rrent periodicals, can one become a worthy member of the engineer- g profession.

Buildings and Equipment.

The buildings occupied exclusively by the Division of Engineering e the Engineering Hall, the Engineering Laboratory, the Power Sta- on, the Forge Shop and Foundry, the Pattern Shop and the Locomo- ve Laboratory.

Engineering Hall.—This building, completed for occupancy at the ening of the spring term, 1903, is a fire proof building, four stories in ight, having a frontage of 208 feet, a depth of 70 feet, with a semi- rcular wing at back, three stories in height.

The architecture is classic in treatment. The exterior is Bedford one with plate glass windows. The interior is finished in pressed ick, with enameled brick in corridors and lavatories.

The building is heated and ventilated by the hot blast system with tomatic regulation, is electric lighted and equipped with modern umbing.

On the first floor are located the dynamo laboratory, work-shop and ecial laboratories of the department of electrical engineering, the ment and masonry laboratories of the department of civil engineering, the metallurgical and ceramic laboratories of the department of mining engineering, and research rooms of the department of mechanical engineering. Also public lavatories for men and women. The corridor of this floor is furnished with 400 lockers for students.

On the second and third floor are respectively the offices of the departments of Mechanical Engineering and Electrical Engineering, and of the departments of Civil Engineering and Mining Engineering. On the second floor is the general assembly room seating 400, two lecture rooms of the department of Mechanical Engineering, two laboratories for electrical engineering, and the instrument and cabinet rooms of the department of Electrical Engineering.

On the third floor are class, draughting and seminar rooms of the department of Civil Engineering, class and seminar rooms and museum of the department of Mining Engineering, a general engineering museum and reading room and a faculty room.

On the fourth floor are two draughting rooms and office of the department of Mechanical Engineering, draughting and instrument rooms of the department of Civil Engineering and photographic and blueprint rooms for the joint use of all departments.

The heating and ventilating apparatus is located in the basement, steam therefore being supplied through a tunnel communicating with the Power House.

The interior finish is light antique oak and the furniture is golden oak. Ample blackboards, convenient and comfortable furniture and furnishings are provided for the needs of the several departments.

Structural and Hydraulic Laboratory.—This is a three story stone and brick building, which has been entirely remodelled and rebuilt into a modern laboratory building, fire proof except the roof. The Hydraulic laboratory occupies a basement wing lined with enamelled brick, together with the floor above it. There are also three large structural laboratory rooms, four computing and research rooms, and five instrument rooms and offices. The surveying department occupies the top floor of this building temporarily.

Power Station.—This is a one story brick building, 36x120, devoted to the lighting and pumping plants of the College, and to the heating plant for the engineering buildings. All of the equipment is used for purposes of instruction, as far as this does not interfere with its other uses. The building contains an engine and dynamo room, a boiler room and a pump room.

Foundry.—This is a one story brick building, 38x78 feet, containing the equipment for instruction in foundry practice. The roof trusses are of steel and calculated to carry traveling cranes for transferring heavy castings and forgings.

New Forge Shop.—This is a one story brick building, 38x78 feet, with a store room at one end in addition. The building was constructed in 1906. It contains equipment for construction in Forge Shop Practice. The roof trusses are of steel and the roof is of slate.

Pattern Shop.—This is a one story brick building, 38x120 feet, devoted to the work of instruction in bench work, wood turning and pattern work. A fire proof room is provided for the storage of patterns.

New Machine Shop.—This is an entirely new building 150x45 feet, just erected. It is practically two stories high, and besides a large machine shop, surrounded by a gallery, it contains laboratory, locker room, office, class room and tool room.

Locomotive Laboratory.—For the temporary protection of the locomotives donated to the Department of Mechanical Engineering by the Chicago & Northwestern railway and by the estate of S. H. Mallory, a corrugated iron structure has been provided.

COURSES IN ENGINEERING.

The following general courses are given by the Dean and Vice Dean and are included in the courses of study in each of the engineering departments.

702. Specifications and Contracts. Required first semester Senior in all four year Engineering courses. Principles of engineering contract law, business methods, specifications for engineering construction. One recitation or lecture per week.

801. History of Engineering. Required second semester Senior year in all four year Engineering courses. The early development of engineering, as traced from history and from the remains of ancient works; development of engineering in later periods and its growth into a separate profession; the effect on civilization, general history and economic problems of the several inventions and other improvements which have marked the development of engineering; study of lives of more famous engineers; also the development of the general technical principles of engineering. One hour per week.

DEPARTMENT OF MECHANICAL ENGINEERING.

W. H. MEEKER, PROFESSOR.
W. M. WILSON, ASSOCIATE PROFESSOR.
M. P. CLEGHORN, F. G. ALLEN, R. A. NORMAN, ASSISTANT PROFESSORS.
J. G. HUMMEL, R. H. PORTER, E. C. POTTER, J. W. CAMERON, JOHN SAWIN, J. B. VARELA, T. R. MINERT, E. M. SPANGLER, JOHN T. BATES, INSTRUCTORS.
PETER VAN GILST, STUDENT ASSISTANT.

The headquarters of this department are in Engineering Hall. The principal offices are on the second floor. On this floor are a lecture room and a combination class and drawing room. On the first floor are two rooms devoted to research work in mechanical engineering.

On the fourth floor are two draughting rooms accommodating 160 students at one time, fitted with combination drawing tables, instrument cabinets and boards, whereby 480 students can be assigned to mechanical drawing and designing in the department. In conjunction with these rooms is a commodious office for the instructing staff in drawing. In addition the department has a common interest in and use of a photographic room, a blue print room on the fourth floor, the engineering museum, and faculty room on the third floor and the assembly room on the second floor.

The draughting, class and lecture rooms are equipped with ample blackboard space and the offices are fitted with convenient furniture for efficient and accurate administration of the interests of the department.

In addition to the above space in the new Engineering Hall, the department occupies the Engineering Laboratory, the Power House, the Machine Shop, Forge, Foundry, the Pattern Shops, and the Locomotive Laboratory.

In the Engineering Laboratory the hydraulic laboratory is used conjointly with the Department of Civil Engineering, the first, second and third floors are used for general engineering laboratory work.

Shop Work.

Students in mechanical engineering pursue the full course in shop work, which consists of six hours per week for three and one-half years. Partial courses are given to the students in mining and electrical engineering.

The system of instruction in the several shops begins with graded exercises calculated to familiarize the student with tools and with the materials used. The exercises are supplanted as soon as possible by work on machines or parts thereof which are to be put into actual use. By this arrangement greater interest is maintained in the work than would be possible with a strict adherence to the exercise system. The object of the shop work is not to teach trades, but to acquaint the student with the tools, materials and difficulties of shop practice and to establish in the mind principles which will aid him in designing and construction work, in the other studies of his course and in his professional career.

The Machine Shop is a new brick building 150 feet long by 45 feet wide and has a main floor and gallery. At one end of the main floor are located locker room, reading room and office. The tool room is placed near the middle of the shop with room inclosed in the gallery above for small stores.

The machine shop is equipped with a twenty-four by twenty-four inch planer, a milling machine, a universal grinding machine, a shaper, a drill press, two emery grinders, a polishing wheel, a power hack saw, a cutting off machine, ten engine lathes of capacities from ten to wenty inch swing and three to ten feet between centers, and three speed nd drilling lathes together with usual assortment of small tools in the ool room. Power is furnished to this shop by an electric motor.

The pattern shop is a brick building, one story high with spacious ttic for storage of lumber. The building is one hundred and twenty feet long by forty feet wide. A tool room twelve by twenty feet is screened off in the center. A fire proof room is provided for patterns. The equipment of the pattern shop consists of a universal buzz saw, a mortising machine, planer, buzz planer, band saw, jig saw, grind stone, fifteen turning lathes, benches for thirty students, thirty compplete sets of small tools and a number of special tools. Power for this building is furnished by a twenty horse power electric motor.

The foundry equipment is housed in a brick building eighty by forty feet. A steel truss roof structure of substantial construction provides support for an overhead traveling crane, which serves the whole floor for handling heavy ladles and castings. A cupola and blower for melting cast iron, a brass furnace, a core oven, core benches, twelve sets of moulder's tools, crucibles, and a large assortment of flasks are used for foundry work.

The new forge shop is housed in a new brick building 38x78 feet, with a store room. Thirty forges, an oil burning annealing and tempering furnace, donated by the Rockwell Engineering Co., with blower and exhaust fan, drill press, vices, anvils, grindstone and small tools, such as sledges, fullers and swages, constitute the equipment for forge work.

Electric motors supply power for the forge and foundry.

Students are advised to work in outside shops during their vacations. Credit is frequently given on work required in the regular course for such commercial experience.

Drawing.

A preparatory course in freehand and linear perspective is given in the Academic year. The regular drawing room work of the course begins with Mechanical Drawing given in the first semester of the Freshman year. This is followed successively by projective drawing, machine sketching and detailing, kinematic drawing, and designing. The last two years of the course are given up to designing.

The object sought by the drawing room course is to enable the student to make, as quickly as possible, neat and accurate working drawings, to design, in general and in detail, machines or parts thereof, and to apply throughout his knowledge of shop methods and his theoretical information acquired in the laboratory and class room.

The two large drawing rooms on the fourth floor of Engineering Hall and a part of the combination drawing and class room on the second floor of the same building are equipped with fifty combination drawing tables, each accommodating four students at once. The drawing boards are placed in frames adjustable as to height and angle and equipped with parallel rulers. Each unit has twelve drawers which are assigned to students for their drawings, instruments and supplies. Extra drawing boards are supplied so that each place can be used by more than one student at different periods.

An extensive collection of blue-prints, photographs, drawings, and trade catalogues, as well as machines and parts thereof, constitute an important part of the working equipment in this branch of the work.

Experimental Engineering.

Experimental work begins with the Junior year and extends to the end of the course. The instruction in this work is thorough, its scope being indicated by the following list of experiments:

Tensile, transverse, torsion and compression tests of materials, properties of lubricants, measurements of power by absorption and transmission dynamometers, steam gauge and indicator spring calibration, flue gas anaylsis, indicator practice, variation of engine speed, fan-blower tests, calorimetry, including throttling and separating calorimeters, weir and water meter calibration, efficiency tests of steam engines, boilers, gas producer and engine, injectors, and steam heating, electric lighting, refrigerating, power and pumping plants, and thermal analysis of the steam engine, coal calorimetry, besides a number of special experiments in the line of investigation. Tests on power plants outside of the College are made as frequently as possible. The engineering laboratory work usually culminates in the thesis, which is an exhaustive investigation of a limited subject. From four to five hundred hours of actual time are spent on theses by students in the engineering courses.

The old and new power houses contain the complete electric light and power and pumping plants of the College, all of which are available for experimental work, and constitute a part of the engineering laboratory equipment of the engineering departments of the College. In the power houses are a 51-H. P. Babcock & Wilcox boiler, two 264-H. P. Cahall horizontal water tube boilers, one 264-H. P. Cahall boiler with Roney mechanical stoker with induced draught, two 260-H. P. Sterling boilers with special furnaces and induced draught, a 250-H. P. Corliss engine direct connected to 150 K. W. generator, a 75-H. P. Straight Line engine, a 50-H. P. Ball engine, with five dynamos for alternating and direct current from 15 to 60 kilowatt capacity. In addition to the above, the engineering laboratory equipment of the department consists of a 50-H. P. Fairbanks, Morse & Co.'s suction gas producer and engine equipped with absorption brake, a 25-H. P. Harris Corliss engine with Alden absorption brake, a twelve horse power Otto gasoline engine, an Ericsson Hot Air Engine, a Wheeler condenser, three Worthington and three other water meters, two Venturi meters, a Pelton water motor, a Holly duplex pump, a Morris Machine Works centrifugal pump, injectors, weir and weighing tanks, gas meters, a Crosby steam gauge tester, fan blowers for experimental work, Westinghouse and New York air pumps, a 100,000 pound Riehle testing machine with Gray autographic device, a 50,000 pound Olsen testing machine, an Olsen torsion testing machine, a Doolittle viscosimeter, a Thurston oil tester, a complete De La Vergne refrigerating machine, gas and air analysis apparatus, anemometers, two Thompson, five Crosby, two Star, and one Richards indicators, dynamometers, a Prony brake, Parr coal calorimeter, platform scales and other apparatus essential and accessory to experimental engineering.

The Hydraulic Laboratory is supplied by about 700 feet of 8-inch and 10-inch cast iron pipe from the College elevated tank, of 163,000 gallons capacity. The availible head is about 150 feet. In the laboratory a tank is provided 50 feet long by 6 feet wide by 4 feet deep, which is used as a measuring and discharging tank for various pieces of apparatus, and which can also be used for experiments on the resistance of models to propulsion. The water is removed from this tank by two sewers; one 6 inches and the other 15 inches in diameter. These are arranged to be used for experiments on the laws of flow in sewer pipes. The laboratory is also provided with pipes of different sizes so arranged that measurements of the friction losses in these pipes and in their fittings can be made. Additional apparatus in the nature of hydraulic motors, pumps of various types, and apparatus for experiments with orifices is being provided.

Locomotive. The Chicago & Northwestern railway has presented to the department an eight-wheel passenger locomotive and tender complete with attachments. The locomotive will be mounted for experimental work and will be a valuable addition to the laboratory equipment.

The principal dimensions of the locomotive are as follows:

Cylinder, 16x24 inches.
Drivers, diameter, 63 inches.
Driving wheel base, 7 feet, 3 inches.
Total engine wheel base, 21 feet, 3 inches.
Total engine and tender wheel base, 42 feet, 3 inches.
Total weight of engine, 70,000 pounds.
Weight on drivers, 40,000 pounds.

The estate of S. H. Mallory of Chariton, Iowa, has presented a narrow gauge locomotive, one of the first in service on the mountain roads of Colorado. The valve mechanism is of the Waelschert type and the drivers and leading wheels are on a truck with the cylinders entirely separate from the boilers.

This engine is a very interesting machine and will be the nucleus for a museum of railway mechanical engineering.

Class Room Work.

In the class room the work is carried on by means of recitations and lectures, a text book and recitations being used wherever practicable; it is necessary, however, to present much material not found in text books, and in such cases recourse is had to the lecture system. The projective lantern is freely used in illustrating subjects presented by lecture.

Inspection Trips.

Once each year or oftener visits of inspection are made by the Senior class to power and manufacturing plants in Chicago and other large centers.

Non-Resident Lecturers.

Lectures by men in active engineering work are introduced from time to time and serve to add interest to the College work by bringing students and teachers in contact with the professional engineer and the problems of modern engineering.

Thesis.

So far as possible the graduating thesis is directed along lines which will produce results directly useful to the industrial interests of the State of Iowa, but this object is not furthered to the detriment of the student's interest to whom the thesis must be first of all an opportunity to think for himself and to apply principles previously inculcated in the regular course of his studies.

Fees.

All students taking the shop work or engineering laboratory are required to pay a fee to defray the cost of materials, power, and breakage. The amount is specified in the description of the courses of study.

Mechanical Engineering at Ames and Throughout the State.

It is the desire of the department to be of all possible service to owners and operators of power stations for heat, light and power, of machine shops and of manufacturing plants in all lines.

To this end correspondence is invited relating to problems on mechanical engineering lines and whenever inquiries by letter or in person indicate a need for investigation demanding the technical skill and equipment of the department the same will be undertaken if possible and the results furnished to all interested.

COURSES IN MECHANICAL ENGINEERING.

Academic Year.

Any student who at entrance presents satisfactory credit for part of the Academic course, or who by examination passes part of it satisfactorily, will be classified in such of the remaining work offered in the Academic year as the Dean of the Junior College and the Dean of Engineering shall consider will best prepare him for his college course. After providing in such classification for the remainder of the thirty credits required for entrance to college, the student may complete his schedule by taking up some of the Freshman studies.

FIRST SEMESTER.

		Required semester hours
Mathematics 3,	Algebra	5
English 2,	Rhetoric and Composition	5
Modern Languages		
Language selected must be carried through the entire year.		
Choice Language 1,	French 5	
Language 5,	German 5	5
Language 30,	Spanish 5	
Civics 1,	Government in State and Nation	2
Mechanical Engineering 19,	Perspective Drawing	1
	Total semester hours	18

SECOND SEMESTER.

		Required semester hours
Mathematics 5,	Plane Geometry	3
Mathematics 6,	Solid Geometry	2
Literature 12,	English Classics	4
Modern Languages		
Language selected must be a continuation of the one chosen in first semester.		
Choice Language 2,	French 5	
Language 6,	German 5	5
Language 31,	Spanish 5	
History 16,	The National Period	3
Mechanical Engineering 29,	Joinery and Wood Turning	1
	Total semester hours	18

*Freshman Year.

FIRST SEMESTER.

		Required semester hours
Mathematics 20,	Algebra	4
Mathematics 21,	Plane Trigonometry	1
Modern Languages		

**Freshmen who show deficient preparation in English or Mathematics may be assigned by the Dean of the Junior College and the Dean of Engineering, to special classes, with one credit hour more work than indicated above, or in case of clear indication of failure, even with this arrangement, they may be assigned to Academic classes.

Language selected must be carried through the entire year.

Choice	Language 18 or 57,	French 3	3
	Language 20 or 73,	German 3	
	Language 36 or 45,	Spanish 3	
	English 10,	Narration and Description	3
	Chemistry 41,	General Chemistry	3
	Mechanical Engineering 130,	Shop Work	2
	Mechanical Engineering 117,	Technical Lecture	
	Mechanical Engineering 121,	Mechanical Drawing	2
	Military 1,	Military Drill	
		Total semester hours	18

SECOND SEMESTER.

			Required semester hours
	Mathematics 22,	Trigonometry	2
	Mathematics 23,	Analytical Geometry	3
	Modern Languages		

Language selected must be a continuation of the one chosen in the first semester.

Choice	Language 19 or 58,	French 3	3
	Language 21 or 74,	German 3	
	Language 37 or 46,	Spanish 3	
	English 11,	Exposition	3
	Chemistry 42,	General Chemistry	3
	Mechanical Engineering 232,	Shop Work	2
	Mechanical Engineering 218,	Technical Lecture	
	Civil Engineering 204,	Descriptive Geometry	2
	Military 2,	Military Drill	
		Total semester hours	18

Sophomore Year

FIRST SEMESTER.

		Required semester hours
Mathematics 24,	Analytical Geometry	2
Mathematics 25,	Calculus	3
English 12,	Argumentation	2
Chemistry 43,	Qualitative Chemistry	3
Physics 303,	Mechanics and Heat	5

Mechanical Engineering 331,	Shop Work	2
Mechanical Engineering 322,	Mechanical Drawing	1
Military 3, or Athletics		
	Total semester hours	18
History 17,	The American People	1

To be taken in Sophomore or Junior year.

SECOND SEMESTER.

		Required semester hours
Mathematics 26,	Differential and Integral Calculus	4
Chemistry 45,	Analytical Chemistry	2
Physics 404,	Electricity and Magnetism and Light and Sound	5
Mechanical Engineering 401,	Analytical Mechanics	3
Mechanical Engineering 437,	Shop Work	1
Mechanical Engineering 439,	Shop Work	1
Mechanical Engineering 423,	Mechanical Drawing	2
Military 4, or Athletics		
	Total semester hours	18
History 18,	American Statesmen	1

To be taken in Sophomore or Junior year.

Junior Year.

FIRST SEMESTER.

		Required semester hours
Mechanical Engineering 502,	Analytical Mechanics	5
Mechanical Engineering 503,	Materials of Construction	3
Mechanical Engineering 541,	Descriptive Engineering	2
Physics 506,	Electricity and Magnetism	3
Mechanical Engineering 524,	Valve Gear Design	1
Mechanical Engineering 512,	Mechanical Engineering Laboratory	1
Mechanical Engineering 533,	Shop work	2
Physics 523,	Physical Laboratory	1
	Total semester hours	18

SECOND SEMESTER.

		Required semester hours
Mechanical Engineering 606,	Analytical Mechanics	5
Mechanical Engineering 605,	Machine Design	3

Mechanical Engineering 642,	Descriptive Engineering	2
Electrical Engineering 610,	Direct Current Machinery	3
Mechanical Engineering 625,	Boiler Design	1
Mechanical Engineering 634,	Shop work	2
Mechanical Engineering 613,	Mechanical Engineering Laboratory	1
Physics 615,	Physical Laboratory	1
	Total semester hours	18

Optional:

Students obtaining approval of the head of the department may classify, during any semester of the Junior or Senior years, in two hours of optional culture work.

Senior Year.

FIRST SEMESTER.

For students graduating in 1910 and later. For course of study of graduates of 1909 see Catalog for 1907-1908.

		Required semester hours
Engineering 702,	Specifications and Contracts	1
Mechanical Engineering 704,	Heat Engines	3
Mechanical Engineering 708,	Railway Mechanical Engineering	3
Mechanical Engineering 707,	Heating and Ventilation	2
Economic Science 9,	Outlines of Economics	3
Mechanical Engineering 726,	Designing	2
Mechanical Engineering 735,	Shop Work	2
Mechanical Engineering 714,	Mechanical Engineering Laboratory	1
Electrical Engineering 717,	Electrical Engineering Laboratory	1
Mechanical Engineering 743,	Mechanical Engineering Seminar	
Mechanical Engineering	Thesis begun	
	Total semester hours	18

SECOND SEMESTER.

For students graduating in 1910 and later. For course of study of graduates of 1909 see Catalog for 1907-1908.

		Required semester hours
Engineering 801,	History of Engineering	1
Mechanical Engineering 809,	Constructive Engineering	3

Civil Engineering 855,	Water Supply Engineering	2
Electrical Engineering 815,	Alternating Current Machinery	3
Mechanical Engineering 827,	Designing	3
Mechanical Engineering 811,	Thesis	4
Mechanical Engineering 815,	Mechanical Engineering Laboratory	1
Electrical Engineering 818,	Electrical Engineering Laboratory	1
Mechanical Engineering 844,	Mechanical Engineering Seminar	
	Total semester hours	18

Optional:

Students obtaining approval of the head of the department may classify, during any semester of the Junior or Senior years, in two hours of optional culture work.

COURSES IN MECHANICAL ENGINEERING.

The following is a summary of the lines of work given in the Mechanical Engineering Department.

Applied Mechanics and Hydraulics.

401	Analytical Mechanics
502	Analytical Mechanics
503	Materials of Construction
512	Laboratory
605	Machine Design
606	Analytical Mechanics
613	Laboratory
686	Analytical Mechanics

Steam and Power Engineering.

625	Designing
704	Heat Engines
707	Heating and Ventilation
708	Railway Mechanical Engineering
714	Laboratory
726	Designing
784	Steam Engines and Boilers
788	Railway Mechanical Engineering
809	Constructive Engineering
811	Thesis
815	Laboratory
827	Designing

Machine Construction.

29	Joinery and Wood Turning
117	Technical Lecture
130	Shop work
218	Technical Lecture
232	Shop work
331	Shop work
437	Shop work
439	Shop work
533	Shop work
634	Shop work
735	Shop work

Drawing and Design.

19	Perspective Drawing
121	Mechanical Drawing
483	Mechanical Drawing
524	Valve Gear Design

181 Mechanical Drawing

322 Mechanical Drawing
423 Mechanical Drawing
605 Machine Designing
625 Designing
726 Designing
827 Designing

Experimental Engineering.

512 Laboratory
613 Laboratory
714 Laboratory
815 Laboratory

Engineering Literature and Reports

541 Descriptive Engineering
642 Descriptive Engineering
743 Seminar
811 Thesis
844 Seminar

19. Perspective Drawing. Required first semester Academic year in Mechanical Engineering, Electrical Engineering and Ceramics. Use of pencil and pen in sketching and linear perspective. One hour credit. Four hours per week.

29. Joinery and Wood Turning. Required second semester Academic year in Mechanical and Electrical Engineering Courses. Manual training in bench and lathe work in wood. One hour credit. Four hours per week. Fee, $3.00.

117. Technical Lecture. Required first semester Freshman year in Mechanical Engineering in connection with required shop work. Study of elementary principles of construction and operation of steam engines, boilers and accessory apparatus. One lecture per week.

121. Mechanical Drawing. Required first semester Freshman year in Mechanical Engineering, Electrical Engineering, Mining Engineering and Ceramics, and first semester of first year in two year courses in Mining Engineering and clay working. Use of drawing instruments, practice in lettering, and making working drawings. Two hours credit. Six hours per week.

130. Shop Work. Required first semester Freshman year in Mechanical Engineering, Electrical Engineering, Mining Engineering and Ceramics and first semester of first year in two year courses in Mining Engineering and Clay Working. Forge work, forging and welding iron and steel, and dressing and tempering tools. Two hours credit. Six hours per week. Fee, $5.00.

181. Mechanical Drawing. Required first semester Freshman year in Civil Engineering. The use of drawing instruments, making of working drawings. One hour credit. Three hours per week.

218. Technical Lecture. Required second semester Freshman year in Mechanical Engineering in connection with required shop work. Study of shop methods, tools and appliances. One lecture per week.

232. Shop Work. Required second semester Freshman year in Mechanical and Electrical Engineering. Foundry work, molding in green and dry sand and cores, casting in iron, brass, mixtures and alloys. Two hours credit. Six hours per week. Fee, $5.00.

322. **Mechanical Drawing.** Required first semester Sophomore year in Mechanical, Electrical, Mining Engineering. Machine Sketching and Detailing. Prerequisites, courses 121 and C. E., 204. One hour credit. Three hours per week.

331. **Shop Work.** Required first semester Sophomore year in Mechanical and Electrical Engineering, second semester Freshman year in Mining Engineering and Ceramics courses, and second semester of the first year in the Two Year courses in Mining and Clay Working. Pattern work, making patterns and core boxes for iron and brass castings. Two hours credit. Six hours per week. Fee, $5.00.

401. **Analytical Mechanics.** Required second semester Sophomore year in all Engineering courses. Statics, graphics and strength of materials. Text book, Mechanics of Engineering, Church. Prerequisites, Physics 303 and Mathematics 25. Three recitations per week.

423. **Mechanical Drawing.** Required second semester Sophomore Year in Mechanical Engineering, Electrical Engineering and Ceramics, and second semester of second year in two year courses in Mining Engineering and Clay Working. Working drawings, tracings, blue prints of complete machines and their details. Prerequisite, course 322. Two hours credit. Six hours per week.

437. **Shop Work.** Required second semester Sophomore year in Mechanical and Electrical Engineering courses. Advanced pattern making, gearing, sweep and moulding machine work. One hour credit. Three hours per week. Fee, $2.00.

439. **Shop Work.** Required second semester Sophomore year in Mechanical and Electrical Engineering courses. Steam fitting and plumbing, cutting and making up threaded, flanged and leaded joints with standard fittings. One hour credit. Three hours per week. Fee, $3.00.

483. **Mechanical Drawing.** Required second semester Sophomore year in Mining Engineering and Ceramics. Of same character as course 423. One hour credit. Three hours per week.

502. **Analytical Mechanics.** Required first semester Junior year in all four year engineering courses. Flexure and dynamics. Text book same as in course 401, which is a prerequisite. Recitations, five hours per week.

503. **Materials of Construction.** Required first semester Junior year in Mechanical Engineering, Electrical Engineering and Ceramics. Text book, Materials of Construction, Johnson. Prerequisite, course 401 and simultaneous work in 512. Recitations, three hours per week.

512. **Laboratory.** Required first semester Junior year in Mechanical, Electrical and Mining Engineering. Properties of materials, calibration of instruments, valve setting, indicator practice and efficiency tests of simple machines. Text book, Experimental Engineering, Carpenter.

Prerequisites, Physics 303 and 404 and Chemistry 41 and 42. One hour credit. Four hours per week. Fee, $3.00.

524. Valve Gear Design. Required first semester Junior year in Mechanical Engineering. Kinematics and valve gear design. One hour credit. Three hours draughting and lecture per week.

533. Shop Work. Required first semester Junior year in Mechanical and Electrical Engineering. Use of hand and machine tools for working iron, steel and brass, finishing and assembling of machines and parts thereof. Prerequisites, Courses 130 and 232. Two hours credit. Six hours per week. Fee, $5.00.

541. Descriptive Engineering. Required first semester Junior year in Mechanical Engineering. Study and reports on engineering processes, methods and current engineering construction. References; magazines, journals and proceedings of engineering societies. Two hours per week.

605. Machine Design. Required second semester Junior year in Mechanical and Electrical Engineering courses. Elements of Machine Design. Text book, Machine Design, Smith and Marx. Prerequisites, course 502, 503 and 512. Recitations, three hours per week.

606. Analytical Mechanics. Required second semester Junior year in Mechanical Engineering. Work, energy and power, plain and reinforced concrete and hydraulics. Prerequisites, 502 and 503. Recitations, five hours per week.

613. Laboratory. Required second semester Junior year in Mechnical Engineering, Electrical Engineering and Ceramics. Continuation of course 512. One hour credit. Four hours per week. Fee, $3.00.

625. Designing. Required second semester Junior year in Mechanical Engineering. Design of steam boilers, also study of form, strength and proportions of the frames and moving parts of cranes and other machines, with detail drawings of the same. Text books, Steam Boilers, Peabody and Miller; Handbook of Information, Cambria Steel Co. Prerequisites, 423, 502 and 512. One hour credit. Three hours per week.

634. Shop Work. Required second semester Junior year in Mechanical Engineering. Course 533 continued. Two hours credit. Six hours per week. Fee, $5.00.

642. Descriptive Engineering. Required second semester Junior year in Mechanical Engineering. Course 541 continued. Two hours per week.

686. Analytical Mechanics. Required second semester Junior year in Civil Engineering, Electrical Engineering, Mining Engineering and Ceramics. Work, Energy and Power and Hydraulics. Prerequisite, course 502. Recitations, four hours per week.

704. Heat Engines. Required first semester Senior year in Mechanical Engineering. Theory and practical application thereof to the steam engine and other heat engines. Text book, Thermodynamics of

Heat Engines, Reeve. Prerequisites, course 512, Physics 303 and 404, and Mathematics 26. Recitations or lectures, three hours per week.

707. Heating and Ventilation. Required first semester Senior year in Mechanical Engineering. Study of modern methods for heating and ventilation. Prerequisite, Physics 303 and simultaneous work in M. E. 726. Recitations or lectures, two hours per week.

708. Railway Mechanical Engineering. Required first semester Senior year in Mechanical Engineering. Construction and operation of Railway Machinery. Prerequisites, courses 605, 613 and 625. Recitations or lectures, three hours per week.

714. Laboratory. Required first semester Senior year in Mechanical Engineering. Efficiency tests of steam, gas, gasoline and hot air engines, boilers, refrigerating machinery and complete plants. Prerequisites, course 613 and simultaneous work in 704. One hour credit. Four hours per week. Fee, $3.00.

726. Designing. Required first semester Senior year in Mechanical Engineering. Computation and design of heating and ventilating plants, tools and machinery. Prerequisites, courses 605 and 625 and simultaneous work in 707. Two hours credit. Six hours per week.

735. Shop Work. Required first semester Senior year in Mechanical Engineering. Advanced machine work, milling, grinding, fitting and assembling. Prerequisite, course 634. Two hours credit. Six hours per week. Fee, $5.00.

743. Seminar. Required first semester Senior year in Mechanical Engineering. Written papers and discussions of assigned topics. One meeting per week.

784. Steam Engines and Boilers. Required first semester Senior in Civil Engineering, Electrical Engineering, Mining Engineering and Ceramics. Construction, operation and maintenance of standard types of steam engines and boilers. Two lectures or recitations per week.

788. Railway Mechanical Engineering. Required first semester Senior year in Civil Engineering of those students electing the special work in Railway Engineering. Construction and operation of railway machinery. Simultaneous work in 784 required. Recitations and lectures, two hours per week.

809. Constructive Engineering. Required second semester Senior year in Mechanical Engineering, Electrical Engineering, Mining Engineering and Ceramics. Principles of design and construction of heating, refrigerating, power, lighting and pumping plants in general and detail. Prerequisites, courses 512, 704 and 784. Lectures, three hours per week.

811. Thesis. Required second semester Senior year in Mechanical Engineering. This course is devoted to special work on an approved topic to be selected before the end of the first semester of the Senior year. Taken by those students of the Mechanical Engineering Department who have completed the work of the Junior year. Expenses of the thesis are adjusted by special arrangement in each case. Equivalent to four hours per week.

815. Laboratory. Required second semester Senior year in Mechanical Engineering. Continuation of course 714. One hour credit. Four hours per week. Fee, $3.00.

827. Designing. Required second semester Senior in Mechanical Engineering. Design of steam engine, selection of engines, boilers and auxiliaries, arrangement of machinery and design of piping for steam power plant. Prerequisites, completion of work of Junior year and simultaneous work in 809. Three hours credit. Nine hours designing and lecture.

844. Seminar. Required second semester in Senior year in Mechanical Engineering. Written papers and discussions of assigned topics. One meeting per week.

DEPARTMENT OF CIVIL ENGINEERING.

A. MARSTON, PROFESSOR.
C. B. STANTON AND J. E. KIRKHAM, ASSOCIATE PROFESSORS.
H. C. FORD, ASSISTANT PROFESSOR.
T. H. MACDONALD, ASSISTANT PROFESSOR IN CHARGE OF ROAD INVESTIGATIONS.
M. I. EVINGER, R. W. CRUM, AND F. M. OKEY, INSTRUCTORS.

The Department of Civil Engineering has its headquarters in new Engineering Hall. The offices of the department occupy rooms 311, 315, and 316 in the third story of the building. In addition, the Department has two large class-rooms and a combination drawing-room 40 feet by 70 feet in the fourth story, besides a cement laboratory and a masonry laboratory in the first story. The Department also has the use, in common with the other Engineering Departments, of the photographic and blue print rooms in the fourth story, the large Engineering Museum in the third story, and the large Assembly Room in the second story. All of these rooms are finely furnished and equipped throughout.

In connection with the offices provision is made for the systematizing of all the work of the Department, and card indexes for correspondence, equipment, and for general engineering literature are provided.

In addition to the space occupied in the new Engineering Hall, part of the equipment of the Department is placed in the Structural and Hydraulic Laboratory. Here are located one drawing room, one recitation room, one instrument room, and two offices, all occupied by the surveying department. There is also located here the Hydraulic Laboratory, and most of the apparatus for testing the materials of construction. In these two lines of work the Departments of Civil Engineering and Mechanical Engineering co-operate.

The Instrumental Surveying Equipment is nearly all kept in room 15 on the third floor of Engineering Laboratory, where suitable cases and racks are provided for storing it in a systematic way. The instrumental equipment includes fifteen engineer's transits, one plain transit, one astronomical transit, one 7 inch altazimuth, one plane table, one surveyor's compass, one railroad compass, one solar compass, six traverse tables, twelve engineer's levels, and numerous chains, tapes, chaining pins, range-poles, level rods, stadia rods, axes, etc. The Department is also well supplied with minor instruments, such as drawing instruments, clinometers, computing machines, planimeter, hand levels, etc. This equipment is being constantly added to from yearly appropriations.

In giving out the instruments for the field work in the Civil Engineering course the captain of each field party signs a receipt for all apparatus taken out, and upon return of the same these receipts are cancelled and kept on file. Students are required to return all apparatus in as good condition as when taken out.

The Cement Laboratory is located in the first story of Engineering Hall, occupying room 105. Stone topped tables are provided on three sides of this room on which the mixing and breaking of briquettes and similar work is done. On two sides of the room are provided tanks underneath these tables for the storing of briquettes. Investigations are constantly under way with cements and similar substances, so that ample storage room is required. Under the stone topped table on the other side of the room are provided cement bins for storage cement and standard sand.

A Fairbanks testing machine is used for breaking the briquettes. There is an ample supply of molds for making the briquettes and the usual apparatus is provided for testing soundness, fineness, and rate of setting.

The Roads and Paving and Masonry Laboratory occupies room 106 of the first floor. This room is intended for the testing of materials for roads, and pavements, and for building materials, especially brick and stone. Laboratory tables are provided for the microscopic work and other work in this line. Grinding apparatus is arranged for preparing specimens for crushing and other tests.

This laboratory also contains the abrasion testing machine, the rattler for tests of road materials, the machines for cementation tests of wood materials, a small ball mill, rock crusher and grinder. Apparatus for testing materials of asphalt pavements is also located in this room, inside a glass inclosure. All the apparatus in this laboratory is operated from shafting driven by an electric motor in a separate inclosure.

The Hydraulic Laboratory is located in the basement and first story of the Structural and Hydraulic Laboratory. The basement is lined with enamelled brick. In the floor above is a large railed opening to the basement occupying about one-third of the floor space. The floors and columns are of reinforced concrete. Water is supplied by about 700 feet of 8 inch and 10 inch cast iron pipe from the college elevated tank of 163,000 gallons capacity. The available head is about 150 feet.

The water is removed from this tank by two sewers, one 6 inches and the other 15 inches in diameter. These are arranged to be used in experiments on the laws of flow in sewer pipes. The laboratory is also provided with wrought iron pipes of different sizes, so arranged that measurements of friction losses in these pipes and in their fittings can be made. Additional apparatus in the nature of weirs, hydraulic motors and pumps of various types is provided.

Structural Laboratory Facilities for other tests of the materials of construction are provided in connection with the Mechanical Engineering Department in the same building. A 100,000 lbs. tension and compression machine, a 100,000 lbs. transverse machine, a 50,000 lbs. tension and compression machine, a torsion testing machine, a 20,000 lbs. wire testing machine, and other apparatus are provided. Two large laboratory rooms, for computations, instrument rooms, and offices are provided.

Standard Engineering Plans.—The Department has a large collection of blue prints of bridges, roof trusses, buildings and similar structures, which have been kindly donated by the principal corporations engaged in structural engineering throughout the country. In a similar way, the principal railway companies of the country have donated standard plans of railway structures; and many plans and specifications of water works, sewer systems, and other engineering works are also to be found in the Department's collection of standard plans. This collection is constantly being added to. It is arranged systematically in large drawers, in filing cases provided in connection with the office equipment. In the general arrangement, plans relating to the same subject are kept in the same drawer. In addition, a card index is provided whereby any drawing in the collection can readily be found.

The Engineering Museum and Library Room on the third floor of the new Engineering Hall, 60 feet in diameter, is intended for the joint use of all the Departments of Engineering. This room is completely supplied with museum cases, and space is provided in which will be placed large models of engineering structures. The collection of specimens for this Museum is just beginning, but the Civil Engineering Department has already a set of the full sized sections of wrought iron and steel commonly used in engineering structures and a collection of specimens of Iowa building brick, paving brick, building stone, and other building materials. The Museum collection will be extended as rapidly as possible. The engineering library is located in this room.

Water Works and Sewage Disposal Plant.—The Civil Engineering Department designed and supervised the construction of the college water-works. The College water tower is the largest in the state. It was designed with special reference to its architectural appearance and cuts of it have been published in four of the books treating of the design of such structures. The pumping machinery is so arranged that college students can readily make tests of the efficiency of the apparatus as part of the class work.

The Civil Engineering Department has also designed and supervised the construction of the College sewage disposal system. This is the first purification plant installed in the state and has been very successful.

The water works system and sewage disposal plant are utilized, so far as possible, to furnish practical object lessons to the students in Hydraulic and Sanitary Engineering.

For many years the Civil Engineering Department has been engaged in conducting various investigations helpful to the industrial interests of Iowa, and the results have been made available in numerous publications. This work is now merged in that of the Engineering Experiment Station, described later in this catalogue.

The Alumni of the Department.—The Civil Engineering Department of the Iowa State College is proud of the record made by its Alumni, in all branches of Civil Engineering, as shown by their eminence as engineers. They are to be found located in responsible positions throughout the country and abroad. The Department maintains an Alumni Directory and endeavors to keep in touch, so far as possible, with its graduates. It is often the case that the Department is able to be helpful to the Alumni by recommending them for positions. The Department receives more and more calls for men to fill good positions. Many of these calls come from the older Alumni themselves.

The nature of the positions open to new graduates may be seen from those occupied by one class one year after graduation. Of this class eleven were engaged in railway engineering in the states of Iowa, Illinois, Nebraska, South Dakota, Idaho, New Mexico, Arizona and Washington; two were engaged in reinforced concrete work in Iowa and New York respectively; four were in Panama on the Panama canal work; one was employed on the Government Civil Engineering work in the Philippine Islands; two were employed with consulting engineers in general engineering practice in Texas and New York respectively; four were employed in irrigation engineering work in Wyoming, Montana, and California; four were employed in structural engineering work in St. Louis, Chicago, and Ambridge, Penn.; one was engaged in water works construction in Iowa, and one was an instructor at the Iowa State College. The salaries of these men ranged up to $125 per month.

During the year we usually have calls considerably exceeding the total number of the graduating class to fill good positions.

This course includes a very careful study of English, Modern Language, either French, German or Spanish, History, Civics, and Economic Science, pure and applied Mathematics, Physics, Geology and Chemistry together with the professional studies in Civil Engineering.

For detailed information as to the nature of the **professional work given in the course of Civil Engineering,** the reader is referred to the statements regarding each specific subject under the head of "Courses" below. It may be said here in a general way that the instruction in

Free-Hand Drawing begins in the Academic course. Mechanical Drawing, Lettering, the use of Water Colors and Pen Topography are studied in the Sophomore year. In the course of instruction in Drawing it is attempted to give the student such facility in drawing that he can do creditable work in an engineering draughting office. Especial attention is paid to the Lettering, and in the finishing up of all other drawings made in connection with his other professional work. The student is required to letter them plainly and neatly and to make finished plates. Throughout the Sophomore, Junior and Senior years the student has practice in the preparation of maps and of drawings and plans of various engineering structures.

The work in Field Surveying practice begins in the Freshman year and continues for three years, six hours per week, with the exception of the second term of the Freshman year, when only three hours are devoted to Field practice. The student becomes familiar with the various instruments and methods by actually using them. Starting with the simplest problems,— pacing, ranging, and chaining, he gradually works up to the use of the transit, level, and others of greater accuracy and delicacy. He becomes familiar with land surveying, leveling, topographical surveying and railroad surveying by actual work in the field. It is the aim of the course to give the student the facility in the handling of instruments and in the carrying out of operations in field surveying which can only be acquired by considerable practice. It is also attempted to give him as much experience as possible in the handling of small parties of men. Besides the above work students actually camp in the field for two weeks in each of three summer vacations, and so become familiar with topographical work on a more extended scale. In lieu of this summer surveying many students obtain remunerative work with engineers throughout the summer vacation. Such work, when properly certified to by the engineer under whom it is taken, is accepted in lieu of the summer camp surveying. Students are encouraged and urged to secure positions of this kind, as it not only assists them financially, but also is of great benefit to them in connection with their professional training.

A course of instruction in Land and Topographical Surveying runs throughout the Sophomore year and one in Railway Engineering runs throughout the Junior year.

Electric Railways and Power Transmission are also studied in the Junior year.

Instruction in Roads and Pavements is given in the second semester of the Senior year. Sanitary Engineering, Water Works Engineering, Bridge Engineering, and Masonry Structures and Foundations are taught in the Senior year. For the details of each of these courses reference should be made to the information given below under the specific course named. The designing of engineering structures by the student begins in the second semester of the Junior year and continues throughout the Senior year. In this work the student actually designs roof trusses and stone and steel truss bridges, preparing the working drawings. A course of actual practice in testing the various materials of construction in the Engineering Laboratory is given in the Junior and Senior years, and is of great value in familiarizing the student with methods of testing and with the properties of the materials of construction.

General instruction in engineering practice and in the spirit of the profession is given by courses of technical lectures in the Freshman and Sophomore years, and by Seminar work of the Junior and Senior years.

Besides the work as given in the outlined course of study, the student in Civil Engineering gains a large part of his experience and training by inspection of engineering work on the inspection tours arranged for the upper classmen. It is planned at least once a year to have the Senior students go on an inspection trip to some point where various engineering works can be inspected and their instructive features noted. Trips are made to Chicago, St. Paul, St. Louis, and other places.

Valuable instruction is also obtained by listening to lectures given by non-resident lecturers. Practicing engineers are invited to the College to give lectures to the engineering students upon the subjects in which they are experts.

The work of the course finally culminates in the thesis, an original investigation carried on by the student to demonstrate his ability to do such work before he graduates. In the past large amounts of time have been devoted by students as a rule to this work, and it has often been the case that the results have been found worthy of publication. Each student should attempt to make his thesis one of the things of which he can justly be proud throughout the remainder of his professional career.

COURSE IN CIVIL ENGINEERING.

Academic Year.

Any student who at entrance presents satisfactory credit for part of the Academic course, or who by examination passes part of it satisfactorily, will be classified in such of the remaining work offered in the Academic year as the Dean of the Junior College and the Dean of Engineering shall consider will best prepare him for his college course. After providing in such classification for the remainder of the thirty credits required for entrance to college, the student may complete his schedule by taking up some of the Freshman studies.

FIRST SEMESTER.

		Required	hours semester
Mathematics 3,	Algebra Review		5
English 2,	Rhetoric and Composition		5
Modern Languages			

The Language selected must be carried through the entire year.

	Course	Subject	Hours
Choice	Language 1,	French 5	5
	Language 5,	German 5	
	Language 30,	Spanish 5	
	Civics 1,	Government in State and Nation	2
	Civil Engineering 47,	Field Work	1
		Total semester hours	18

SECOND SEMESTER.

Course	Subject	Required semester hours
Mathematics 5,	Plane Geometry	3
Mathematics 6,	Solid Geometry	2
Literature 12,	English Classics	4
Modern Languages		

The Language selected must be a continuation of the one chosen in the first semester.

	Course	Subject	Hours
Choice	Language 2,	French 5	5
	Language 6,	German 5	
	Language 31,	Spanish 5	
	History 16,	The National Period	3
	Civil Engineering 48,	Technical Drawing	1
		Total semester hours	18

**Freshman Year.

FIRST SEMESTER.

Course	Subject	Required semester hours
Mathematics 20,	Algebra	4
Mathematics 21,	Plane Trigonometry	1
Modern Languages		

The Language selected must be continued through the entire year.

	Course	Subject	Hours
Choice	Language 18 or 57,	French 3	3
	Language 20 or 73,	German 3	
	Language 36 or 45,	Spanish 3	
	English 10,	Narration and Description	3
	Chemistry 41,	General Chemistry	3
	Civil Engineering 102,	Field Work	2

**Freshmen who show deficient preparation in English or Mathematics may b assigned by the Dean of the Junior College and the Dean of Engineering, to specia classes, with one credit hour more work than indicated above, or in case of clear indication of failure, even with this arrangement, they may be assigned to Academi classes.

Civil Engineering 101,	Civil Engineering Drawing	1
Mechanical Engineering 181,	Mechanical Drawing	1
Civil Engineering 141,	Technical Lecture	
Military 1,	Military Drill	
	Total semester hours	18

SECOND SEMESTER.

		Required semester hours
Mathematics 22,	Trigonometry	2
Mathematics 23,	Analytical Geometry	3
Modern Languages		

The Language selected must be a continuation of the one chosen in the first semester.

Choice	Language 19 or 58,	French 3	3
	Language 21 or 74,	German 3	
	Language 37 or 46,	Spanish 3	

English 11,	Exposition	3
Chemistry 49,	General Chemistry	4
Civil Engineering 204,	Descriptive Geometry	2
Civil Engineering 203,	Field Work	1
Civil Engineering 242,	Technical Lecture	
Military 2,	Military Drill	
Civil Engineering 231,	Summer Surveying	

All students in Civil Engineering go into camp fifteen days each summer vacation for surveying practice.

Total semester hours	18

Sophomore Year.

FIRST SEMESTER.

		Required semester hours
Mathematics 24,	Analytical Geometry	2
Mathematics 25,	Calculus	3
English 12,	Argumentation	2
Physics 303,	Mechanics and Heat	5
Civil Engineering 308,	Surveying	4
Civil Engineering 349,	Advanced Descriptive Geometry	1
Civil Engineering 305,	Drawing	1
Civil Engineering 343,	Technical Lecture	
Military 3, or Athletics		
	Total semester hours	18
History 17,	The American People	1

To be taken in Sophomore or Junior year.

SECOND SEMESTER.

		Required semester hours
Mathematics 26,	Differential and Integral Calculus	4
Physics 404,	Electricity and Magnetism and Light and Sound	5
Mechanical Engineering 401,	Analytical Mechanics	3
Civil Engineering 409,	Surveying	4
Civil Engineering 450,	Advanced Descriptive Geometry	1
Civil Engineering 407,	Drawing	1
Civil Engineering 444,	Technical Lecture	
Military 4, or Athletics		
Civil Engineering 432,	Summer Surveying	

All students in Civil Engineering go into camp fifteen days each summer vacation for surveying practice.

	Total semester hours	18
History 18,	American Statesmen	1

To be taken in Sophomore or Junior year.

Junior Year.

FIRST SEMESTER.

		Required semester hours
Mechanical Engineering 502,	Analytical Mechanics	5
Civil Engineering 510,	Railway Engineering	5
Electrical Engineering 503,	Electric Railways and Power Transmission	2
Physics 523,	Physical Laboratory	1
Mathematics 27,	Spherical Trigonometry	1½
Civil Engineering 524,	Practical Astronomy and Geodesy	2½
Civil Engineering 514,	Civil Engineering Laboratory	1
Civil Engineering 527,	Civil Engineering Seminar	
	Total semester hours	18
Optional:		
History 7,	America in the Far East	2
English 7,	Debating	1
Literature 13,	Literature	2
Civics 7,	Comparative Government	2

SECOND SEMESTER.

		Required semester hours
Mechanical Engineering 686,	Analytical Mechanics	4
Civil Engineering 611,	Railway Engineering	4

Civil Engineering 652,	Tunneling	1
Civil Engineering 617,	Structural Engineering	4
Civil Engineering 653,	Materials of Construction	2
Economic Science 9,	Outlines of Economics	3
Civil Engineering 615,	Civil Engineering Laboratory	1
Civil Engineering 628,	Civil Engineering Seminar	
Civil Engineering 633,	Summer Surveying	

All students in Civil Engineering go into camp fifteen days each summer vacation and conduct an organized topographical survey. In place of the two weeks' summer surveying for any year there may be substituted not less than four weeks' actual engineering work done for some competent engineer, a reputable firm, or department engaged in engineering work, if certified by engineer under whom taken, on regular blank furnished by Department of Civil Engineering.

Optional:

History 9,	Far Eastern Question	2
English 8,	Debating	1
Literature 14,	Literature	2
Civics 7,	Comparative Government	2

Senior Year.

FIRST SEMESTER.

For students graduating in 1910 and later. For course of study of graduates of 1909 see Catalog for 1907-1908.

		Required semester hours
Civil Engineering 718,	Structural Engineering	4
Civil Engineering 712,	Roads and Pavements	2
Civil Engineering 723,	Masonry and Foundations	2
Civil Engineering 721,	Sanitary Engineering	3
Mechanical Engineering 784,	Steam Engines and Boilers	2
Civil Engineering 716,	Civil Engineering Laboratory	1
Civil Engineering 725,	Thesis begun	
Civil Engineering 729,	Seminar	
Engineering 702,	Specifications and Contracts	1
Special Line of Work.		

Each Senior Civil Engineer must elect one of the following special lines at the beginning of his Senior year and this election will govern throughout both Senior semesters.

Choice	Civil Engineering 738	Structural Engineering 3	3
	Mechanical Engineering 788, and	Railway Mechanical Engineering 2	
	Civil Engineering 754,	Signal Engineering 1	
	Civil Engineering 735,	Irrigation Engineering 3	
		Total semester hours	18

Optional:

Economic Science 12,	Engineering Economics	2
History 7,	America in the Far East	2
Literature 13,	Literature	2
Civics 7,	Comparative Government	2
Botany 33,	Technical Bacteriology	3

SECOND SEMESTER.

For students graduating in 1910 and later. For course of study of graduates of 1909 see Catalog for 1907-1908.

		Required semester hours
Civil Engineering 819,	Structural Engineering	2
Civil Engineering 820,	Arches and Reinforced Concrete	3
Civil Engineering 822,	Water Supply Engineering	3
Geology 803,	Engineering Geology	3
Civil Engineering 826,	Thesis	3
Civil Engineering 830,	Seminar	
Engineering 801,	History of Engineering	1
Special Line of Work.		

The special line of work selected at the beginning of the Senior year must be continued through the semester.

Choice	Civil Engineering 839,	Structural Engineering 3	3
	Civil Engineering 834,	Railway Economics 3	
	Civil Engineering 836,	Hydraulic Engineering 3	
		Total semester hours	18

Optional:

Economic Science 12,	Engineering Economics	2
History 9,	The Far Eastern Question	2
Literature 14,	Literature	2
Civics 7,	Comparative Government	2
Horticulture 17,	Wood Technology	3
Chemistry 39,	Water and Sewage Analysis	3

COURSES IN CIVIL ENGINEERING.

47. Field Work. Required first semester Academic year in Civil Engineering. Field work, three hours per week. Text book, Pence & Ketchum's Surveying Manual.

This course is designed to give the student some familiarity with the elements of surveying; i. e., pacing, ranging, and chaining, before they come to the Freshman year, and to put them in a position to get practical surveying work during their first summer vacation. One hour credit.

48. Technical Drawing. Required second semester Academic year in Civil Engineering. An elementary course in drawing and free hand lettering for Academic students and is prerequisite to the regular Freshman year course in Lettering. Text book, Reinhart's Lettering. One hour credit. Three hours drawing per week.

102. Field Work. Required first semester Freshman year in Civil Engineering. Two hours credit. Six hours field work per week. Fee, $2.00.

Courses 102 and 203 are intended to train the student in the solution of the simple surveying problems and in the use of the simple surveying instruments; to give him a thorough preparation for the surveying work of the Sophomore year; and to give him sufficient experience to enable him to obtain a position as chainman or rodman during the summer vacation.

The class is divided into squads of three men each, the idea being to keep the number of men in a squad as low as is consistent with performing the work in order that each man may become familiar with all parts of the work. Pence & Ketchum's "Surveying Manual" is used as a text book and the men are required to perform the problems in strict accordance with the instructions in the "Manual," to check their work within practical limits, and to keep, in a standard field book, complete notes of all problems. Office problems are given from time to time, and as the field work requires it, recitations and lectures are given.

NOTE—The work in courses 102 and 203 is preparatory to the Field Work of the Sophomore and Junior year, which takes the same number of hours per week each year. Thus the student has the training to be obtained by three years' actual experience in the field.

141. Technical Lecture. Required first semester Freshman year in Civil Engineering. Lectures on Civil Engineering Profession, on the reading of current literature, and on the elementary general features of engineering drawing and field work. See course 444. One lecture per week.

203. Field Work. Required second semester Freshman year in Civil Engineering. For general explanation of the work covered by this course of study, see course 102. One hour credit. Three hours field work per week. Fee, $2.00.

204. Descriptive Geometry. Required second semester Freshman year in all four year Engineering courses, and second semester first year in two year courses in Mining Engineering and Clay Working. Many original problems are also solved in class and in the draughting room. Descriptive Geometry is the connecting link between pure mathematics and technical drawing, and is taught partly as a theoretical and partly as an applied subject. Many of the problems have direct application to engineering work. Prerequisites, Mechanical Drawing, Mathematics 3 and 5. Two hours credit. Five hours drawing and 1 hour lecture per week.

231. Summer Surveying. Required at close of Freshman year in Civil Engineering. See course 633. Fifteen days work in the field.

242. Technical Lecture. Required second semester Freshman year in Civil Engineering. Lectures on the work of the axemen, chainmen, and rodmen in general surveying and railway surveying and on camp equipment and management. One lecture per week.

305. Drawing, Tinting, Shading and Pen Topography. Required first semester Sophomore in Civil Engineering. Course 101 continued. Practice with water colors, as used in tinting and in shading, the formation and use of topographical and structural symbols, contours and hatchings, and the preparation of topographical maps. One hour credit. Three hours per week.

308. Surveying. Required first semester Sophomore year in Civil Engineering, elective first semester Junior or Senior year in all Agricultural and Science courses. Prerequisite, Mathematics 5 and 6. Four hours credit. Recitations, two hours and field work, six hours per week. Fee, $3.00.

Courses 308 and 409 are continuations of courses 102 and 203. The same method of organizing squads is followed. The work takes up the care and adjustments of surveying instruments, various problems in surveying illustrating the measurement of angles, running traverses by several methods, differential and profile leveling, uses of the plane table, determination of the true meridian by both Polaris and Solar observations, taking topography by various methods and land surveying, with special reference to United States system of land subdivision and to the retracing of lines and location of lost corners. Office work in connection with the field work requires the plotting of maps and profiles and the calculation of areas and balancing of surveys. Calculation of quantities and estimates of cost are made in connection with paving and drain surveys. Pence & Ketchum's "Surveying Manual" is used as a field manual.

The recitations cover Johnson's "Theory and Practice of Surveying."

The study of Drainage Engineering demands special attention in this state and the course is adapted to such needs. The principles of the subject receive careful attention in the class room and are put into immediate practice in the investigation of various tracts of land in the vicinity of the College where development by drainage is advisable. The thorough drainage of individual forms is considered, and also the engineering and legal methods employed on large districts under county control.

The usual reports of the engineer are required from each student, including complete maps and profiles, estimates of cost, and the report of the Commission on the assessment of the various properties. During the past few years it has frequently been found practicable for students to find remunerative work at drainage engineering at various places in the state in addition to their regular class work. Elliott's "Engineering for Land Drainage" is used as a text book for this portion of the work.

343. Technical Lecture. Required first semester Sophomore year in Civil Engineering. Lectures on tracing, blue-printing and other methods of reproducing engineering drawings, and on the work of the beginner in a structural drafting office. See course 444. One lecture per week.

345. Surveying. Required first semester Sophomore year in Mining Engineering and Ceramics and first semester of second year in two year course in Mining Engineering. Two hours credit. One recitation and three hours field work per week. See course 446. Fee, $2.00.

349. Advanced Descriptive Geometry. Required first semester Sophomore year in Civil Engineering. Consists in the solution of problems relating to warped surfaces and the preparation of isometrical projections of standard structures from working drawings. Text book, MacCord's Descriptive Geometry. Prerequisite, C. E. 204. One hour credit. Three hours drawing and lecture required.

407. Drawing. Plans of Structures. Required second semester Sophomore year in Civil Engineering. Course 305 continued. Preparation of working drawings of standard structures, especially railway structures. Prerequisite, course 305. One hour credit. Three hours per week.

409. Surveying. Required second semester Sophomore year in Civil Engineering and elective second semester Junior or Senior in all Agricultural courses. Course 308 continued. For general explanation of the work covered by this course of study, see course number 308. Recitations, two hours and field work, six hours per week. Fee, $3.00.

432. Summer Surveying. Required at close of Sophomore year in Civil Engineering. See course 633. Fifteen days' work in field.

444. Technical Lecture. Required second semester Sophomore year in Civil Engineering. Lectures on drainage and topographical surveying, and on work of inspectors. One lecture per week.

Courses 141, 242, 343 and 444 inclusive are required of all Civil Engineers, and are designed to help inculcate the spirit of the engineering profession, and to permit the presentation of many things essential to the Civil Engineer which cannot readily be given in connected form in connection with the individual subjects of the course.

446. Surveying. Required second semester Sophomore year in Mining Engineering and Ceramics and second semester of second year in two year courses in Mining and Clay Working. Two hours credit. One recitation and three hours field work per week. Fee, $2.00.

Courses 345 and 446 are an abridgement of courses 308 and 409 and aim to cover only the most important uses of the tape, level and transit. Text book, Pence and Ketchum's "Surveying Manual."

450. Advanced Descriptive Geometry. Required second semester Sophomore in Civil Engineering. The drawing is based on the principles of Descriptive Geometry and includes the solution of a number of problems in Shades, Shadows and Perspective. The work in Perspective Drawing includes the preparation and architectural rendering of a perspective drawing of a building or engineering structure, from the detailed plans. Prerequisite, course 204. One hour credit. Three hours per week.

510. Railway Engineering. Required first semester Junior year in Civil Engineering. Study of the methods of railway location, preliminary surveys made by both the cross section and the stadia methods; methods of the solution of the simple, compound, and vertical curves; the transition spiral, crossovers, turnouts, and wye tracks; the computation of earthwork and the determination of haul by the mass diagram.

During this semester a preliminary survey is made of a short line from which is prepared a contour map on which a paper location is made and the field notes calculated. This line is then located in the field and cross-sectioned. The grading is calculated, bills of material made up, bridges staked out, and cost of line is estimated. Text book, Allen's "Curves and Earthwork;" Talbott's "Transition Spiral." Prerequisites, Civil Engineering, 102, 203, 308, and 409. Five hours credit. Recitations, three hours and field work, seven hours per week. For one of the recitations, three hours of office work is substituted during part of the semester. Fee, $3.00.

514. Engineering Laboratory. Required first semester Junior year in Civil Engineering. Work in testing laboratory, making various standard tests of the materials of construction, including cement, building stones, paving brick, wood, cast iron, wrought iron, and steel. Prerequisite, M. E. 401. One hour credit per semester. Three hours per week. Fee, $5.00.

524. Practical Astronomy and Geodesy. Required first semester Junior year in Civil Engineering. Study of ordinary methods of determining latitude, longitude, and time with their application to the Geodetic Surveying. Prerequisite, C. E. 102, 203, 308, 409. Two and one-half hours credit. Recitation, four hours and laboratory, three hours per week during last ten weeks of the semester.

527. Engineering Seminar. Required first semester Junior year in Civil Engineering. See course 830.

611. Railway Engineering. Required second semester Junior year in Civil Engineering. Study of the methods of railway construction, and maintenance, standard structures, track accessories, yards and terminals, etc., and the details of the economics of railroad location are dealt with at some length. The field work of this semester consists in the making of station surveys of existing towns, and the mapping of the same. The measuring and detailing of trestles, slip switches, turnouts, etc. Texts, Webb's "Railroad Construction;" Tratman's "Railway Track and Track Work."

During the past year complete location surveys for private companies, including complete estimates of cost and all the maps, profiles and other data needed to inaugurate construction were made of two interurban railways in Iowa by parties made up of students selected from the regular class, under direction of the professor in charge. One of these lines was thirty miles in length. It is the general policy to continue such work from time to time as opportunity occurs, selecting the students to do the work from those showing greatest proficiency in this and related studies. Prerequisite, Civil Engineering 510. Four hours credit. Recitations, two hours a week and field work or draughting seven hours a week. Fee, $3.00.

615. Engineering Laboratory. Required second semester Junior year in Civil Engineering. See 514. Prerequisites, Civil Engineering 514 and Mechanical Engineering 502. One hour credit.

617. Structural Engineering. Required second semester Junior year in Civil Engineering.

The recitation periods for the first few weeks are devoted to practical lectures upon the manufacturing of the standard steel shapes (from ore to finished product) and upon the fabricating of steel structures in the structural shops, from these shapes, and upon the general construction of steel structures, pointing out the names and the construction of the various types of structures; also the names and style of details of their parts so as to give the student a general knowledge of the details of metal structures before considering the theory involved in their design. At the same time in the drawing room the student is trained in making detail drawings of typical parts of structures, such as I beams with standard connections, posts, stringers, floor-beams, etc. This is intended to train the student in structural drafting and at the same time in the use of the manufacturers' Books. After this lecture course and throughout the remainder of the semester, the recitations are devoted to the theory of stresses in ordinary metal structures while the work in the drawing room consists of actual determining of stresses in the above structures by the analytical and graphical methods, and also by the method of influence lines, using both uniform and concentrated loads, and of the designing and detailing of some of the above structures.
Text book, Instructor's Notes. Credit, four hours.

628. Engineering Seminar. Required second semester Junior year in Civil Engineering. See course 830.

633. Summer Surveying. Required at close of Junior year in Civil Engineering. Fifteen days' work in field.

In the work of Courses 231, 432 and 633, part of the professors of Civil Engineering and the students in the course in Civil Engineering go into camp for fifteen days each summer vacation beginning the Saturday before Commencement, and conduct an organized topographical survey of some region in the state. Each year's work continues that of the preceding year, until a large area is mapped. At present Lake Okoboji and surrounding territory are being mapped. Lower classmen will serve in subordinate positions. Upper classmen will have responsible charge of parties, and will do the triangulating and final mapping. Students must pay their own traveling and living expenses. A corps of student officers has direct charge of the work, part of these officers being elected by the students and part appointed by the department. It is one of the greatest honors in the course of Civil Engineering to be chosen on this corps of officers. The list of student officers for the summer camp of 1907 was as follows:

Chief Engineer—Frank Tiara.
Assistant Chief Engineer—F. S. Naiden.
Computer—D. Wheeler.
Chief Draughtsman—E. F. Kelly.
Junior Commissary—H. M. Scholton.
Sophomore Commissary—C. E. Wright.
Freshman Commissary—D. V. Butler.

652. **Tunneling.** Required second semester Junior year in Civil Engineering. The study of the methods of making tunnel excavation; the use and handling of various explosives, use and construction of the pneumatic heading, etc. Prerequisite, Civil Engineering 510. One hour credit. Lecture or recitation, one hour a week.

653. **Materials of Construction.** Required second semester Junior year. A study of the materials of engineering construction, including cement, lime, stone, brick, sand, steel, etc. Two hours credit.

656. **Structural Engineering.** Required second semester Junior year in Mining Engineering and Ceramics courses. The recitation periods for the first few weeks are devoted to practical lectures upon the manufacturing of the standard steel shapes (from ore to finished product) and upon the fabricating of steel structures in the structural shops, from these shapes, and upon the general construction of steel structures, pointing out the names and the construction of the various types of structures; also the names and styles of details of their parts so as to give the student a general knowledge of the details of metal structures before considering the theory involved in their design. At the same time in the drawing room the student is trained in making detailed drawings of typical parts of structures, such as I beams with standard connections, posts, stringers, floor-beams, etc. This is intended to train the student in structural drafting and at the same time in the use of the manufacturers' Hand Books. After this lecture course, and throughout the remainder of the semester, the recitations are devoted to the theory of stresses in ordinary metal structures while the work in the Drawing room consists of actual determining of stresses in the above structures by the analytical and graphical methods, and also by the method of influ-

ence lines, using both uniform and concentrated loads, and of the designing and detailing of some of the above structures. Three hours credit.

712. Roads and Pavements. Required first semester Senior year in Civil Engineering. Study of good roads problem, traffic over country roads, tractive resistance, the best methods of constructing and maintaining earth, gravel, and broken stone roads, and the cost of various kinds of roads. In the study of country roads, especially as relating to Iowa conditions, great assistance is given by the fact that the College is by law the State Highway Commission of Iowa. All its data, plans, maps and publications are available and are largely made use of. In connection with pavements among the topics studied are city streets and grades, classes and methods of construction of pavements, and the cost of various kinds of paving. Text book, Baker's "Roads and Pavements." Recitations, two hours per week.

713. Roads and Pavements. Elective first semester Junior or Senior year in all Agricultural courses. Work similar to course 712. Text book, Baker's "Roads and Pavements." Recitations, two hours per week.

716. Engineering Laboratory. Required first semester Senior year in Civil Engineering. Experiments in Hydraulic laboratory, as gauging the flow of water over weirs, through orifices and in sewer pipes, measuring the friction in pipes, and testing the efficiency of pumps and hydraulic motors. One hour credit. Three hours per week. Fee, $3.00.

718. Structural Engineering. Required first semester Senior year in Civil Engineering. After a short review of the structural work taken in the Junior year, the remainder of the semester is devoted to the theory of stresses in what is known as "higher structures," that is, cantilever and suspension bridges, steel arches, lift bridges, and draw bridges, etc., and to the designing of same.

Text-book, Johnson's "Framed Structures," supplemented by Instructor's Notes. Credit, four hours.

721. Sanitary Engineering. Required first semester Senior year in Civil Engineering. Study of principles and methods involved in the design, construction and maintenance of sewerage systems, house plumbing and sewage disposal. Text-book, Folwell's "Sewerage," and Professor Marston's Notes. Two recitations and one afternoon of designing per week. Three hours credit.

723. Masonry Structures and Foundations. Required first semester Senior year in Civil Engineering. Study of principles involved in the design and construction of foundations, and in the design, construction, and maintenance of all classes of masonry structures. Text-book, Baker's "Masonry Structures." Two recitations per week.

725. Thesis. Required first semester Senior year in Civil Engineering. Work begun.

729. Engineering Seminar. Required first semester Senior year in Civil Engineering. See Course 830.

735. Irrigation Engineering. Required first semester Senior year in Civil Engineering by those students who elect special work for the Senior year in Hydraulic Engineering. Irrigation history and laws, the use and duty of water, irrigation surveys and designs, the design and construction of ditches and flumes, and dams and reservoirs. Special attention is given to the work of the United States Reclamation Service. Considerable time is devoted to reference work, consisting in studying and preparing reports upon various irrigation systems and structures and other topics of interest. In this work the current technical literature is used to a large extent. Three hours per week are devoted to designing of irrigation structures, dams, headworks, regulators, canals, etc. Estimates of cost of the structures designed are made. The text-book is Wilson's "Irrigation Engineering." Three hours credit. Recitations two hours and designing three hours per week.

738. Structural Engineering. Required first semester Senior year in Civil Engineering by students who elect special work in Structural Engineering. This course is taught in conjunction with Civil Engineering 718 in a special class to students taking structural engineering making, a total of seven credit hours. The work in "higher structures" is very much more thorough and complete than in 718 alone. Three hours credit.

751. Surveying. Required first semester Senior year in Electrical Engineering. Recitation one hour and field work three hours per week. Text-book, Pence & Ketchum's Surveying Manual.

Course 751 is designed to give to students in Electrical Engineering a good working knowledge of the engineer's transit and level and their common uses, sufficient to enable them to perform such elementary surveying problems as they are likely to meet in connection with their electrical work. Three hours credit.

754. Signal Engineering. Required first semester Senior year in Civil Engineering by those who elect special work for senior year in Railway Engineering. A study of the methods of signalling by the various railroads, their relative effectiveness and the rules governing the use of the same, train orders, interlocking, etc. Prerequisites, Civil Engineering 510 and 611. One hour credit.

819. Structural Engineering. Required second semester Senior year in Civil Engineering. This work during the first part of the semester is really a continuation of the structural work taken by same students in the first semester, after which the time will be devoted to a general review of Structural Engineering, in order that the student may have a working knowledge of the subject. Two hours credit.

820. Arches and Reinforced Concrete. Required second semester Senior year in Civil Engineering. The recitations are devoted to the mechanics of reinforced concrete construction and masonry, analyzing the stresses in reinforced concrete slabs, beams, floors, roofs, retaining walls, and also masonry and reinforced concrete arches. The work in the drawing room consists of: Designing a reinforced concrete beam highway bridge; beams, columns, and floor for an office building; designing of a masonry and a reinforced concrete arch, and also a retaining wall, making complete tracings of most of the designs.

Text-book, "Principles of Reinforced Concrete Construction," by Turneaure and Maurer, supplemented by Instructor's Notes. Three hours credit.

822. Water Supply Engineering. Required second semester Senior year in Civil Engineering. The principles and methods involved in the design, construction and maintenance of water works systems. Textbook, Turneaure and Russel's "Water Supply Engineering." Three recitations and one afternoon of designing per week. Three hours credit.

826. Thesis. Required second semester Senior year in Civil Engineering. Original research on some chosen subjects, as the study and design of some engineering project (including the surveys), the investigation of some engineering question, or an experimental investigation. Three hours credit. Nine hours per week. Students are required to put in as much additional time as may be necessary to thoroughly work up the subject chosen, and to prepare a well-digested and complete write-up of the results.

830. Engineering Seminar. Required second semester Senior year in Civil Engineering.

The Civil Engineering Seminar, Courses 527, 628, 729 and 830, meets once each week, while College is in session, and has for its members the professors and the instructors in Civil Engineering, and all students in the Junior and Senior classes in the course in Civil Engineering.

The Juniors and Seniors meet separately and each seminar has the organization of an engineers' club, and arranges for programs by students and others similar to those of engineering clubs.

834. Railway Economics. Required second semester Senior year in Civil Engineering by those who elect special work for Senior year in Railway Engineering. Study of the organization, operation, construction, extension, improvement, existing conditions, operation and regulation of railways with reference to their great duty as public servants as well as their obligations to the holder of their securities.

First—A study of the principles of incorporation, keeping in mind the weighty obligations assumed by any public service corporation who is given and accepts the "Right of eminent domain."

Second—A study of a railway's relation to its stockholders.

Third—The relation of the national government and the methods of government regulation existing and proposed.

Fourth—Their relation to the state and the shipper, including the subjects of railway capital, income, expenditures, the basis of freight rates, freight classification and taxation. Three lectures per week. Prerequisites Civil Engineering 510 and 611, and Mechanical Engineering 788.

836. Hydraulic Engineering. Required second semester Senior year in Civil Engineering by those students who elect special work for the Senior year in Hydraulic Engineering. Hydraulic power development, water wheel, turbine, and impulse wheel installations are studied in their various details, the text-book being, Frizell's "Water Power." In addition to the text-book work, considerable time is spent in reference work, studying from the current technical literature and preparing reports upon various existing power plants and other topics of interest along the same lines. Three hours per week are devoted to designing the various structures connected with hydraulic power plants,—dams, penstocks, power canals, pipe lines, etc. Estimates of cost of the structures designed are made. Three hours credit. Recitations two hours and designing three hours per week.

839. Structural Engineering. Required second semester Senior year in Civil Engineering by students who elect special work in Structural Engineering. This course is taught in conjunction with Civil Engineering 819 in a special class to students taking structural engineering, giving a total of five credit hours and is very much more thorough and complete, especially in "higher structures." Three hours credit.

855. Water Supply Engineering. Required second semester in Mechanical Engineering. This course is the same as 822 with the omission of the designing. Two hours credit.

DEPARTMENT OF PHYSICS AND ELECTRICAL ENGINEERING.

LOUIS BEVIER SPINNEY, PROFESSOR.
FRED ALAN FISH, PROFESSOR OF ELECTRICAL ENGINEERING.
ADOLPH SHANE, ASSOCIATE PROFESSOR OF ELECTRICAL ENGINEERING.
W. B. ANDERSON, ASSISTANT PROFESSOR OF PHYSICS.
A. H. HOFFMAN, ASSISTANT PROFESSOR OF PHYSICS.
WM. KUNERTH, INSTRUCTOR IN PHYSICS.
H. A. MCCUNE, INSTRUCTOR IN PHYSICS AND ELECTRICAL ENGINEERING.

This department aims to meet the needs of young men who have in mind the practice of electrical engineering in any of its various applications. In outlining the courses the object in view has been to secure for the student a thorough drill in those sciences, the principles of which underlie all electrical engineering practice, to secure for him a training in the application of scientific principles to the solution of practical problems in engineering, and to familiarize him with such methods of the laboratory and testing room as are available for practical and commercial determinations.

The sciences of Mathematics, Physics and Chemistry, are emphasized, as it is believed they are of first importance in such a course. The attention of the student is directed to the value of these subjects and he is urged to give them his most careful consideration.

In recognition of the fact that a knowledge of Mechanical Engineering is essential to many electrical engineering operations a large part of the student's time is devoted to a training in this direction.

Physics is the basis of the study of electricity and magnetism, the phenomena of which underlie electrical engineering theory and design, and is manifestly of sufficient importance to demand considerable time and attention in the training of the electrical engineer. In addition to the work in physics prescribed for all engineering students, the electrical engineering student spends six to twelve hours per week in the Junior and Senior years in the physical laboratory and class room.

The Physics lecture room is modern in its equipment, which includes a convenient system of darkening shutters for the windows and a large permanent lantern screen, to facilitate demonstration work. At the lecture room tables are electric, gas and water connection, placing at the disposal of the lecturer water pressure, compressed air and electric currents from storage batteries, and direct or alternating current dynamos.

The department has a good equipment in apparatus for demonstration purposes, which is stored in apparatus rooms adjoining the lecture room.

The general laboratory rooms are large and well lighted and are equipped with heavy oak tables, slate-top piers and wall tables with heavy stone tops for the support of the laboratory apparatus. Convenient electric, gas and water connections are provided. A very serviceable equipment in the apparatus used in general physical laboratory work is furnished. Among other apparatus may be mentioned a laboratory clock, with electric connections, a chronograph, a reversion pendulum, two torsion pendulums for the experimental determination of "moment of inertia" and the "coefficient of simple rigidity," a physical pendulum, apparatus for the determination of the "intensity of gravity" by observations on a body rolling on an inclined plane, analytical balances, Jolly's balance, hydrostatic balance, apparatus for the determination of "Young's Modulus" by stretching and by bending, apparatus for the coefficient of linear expansion, a cathetometer, optical benches, telescopes and microscopes, spectroscopes, a saccharimeter, hydrometers, thermometers, barometers, galvanometers, Wheatstone bridges, "testing apparatus," electrocalorimeters, silver, copper and water coulombmeters, etc.

The photometry rooms are equipped with several photometer benches and are furnished with gas and electric connection. The arrangement of apparatus is made with a view of facilitating the regulation tests of arc and incandescent lamps as well as those of other sources of illumination.

Besides several ordinary photometers, the equipment includes a Matthew's Integrating Photometer, a storage battery of sixty 15 ampere cells, a recording voltmeter, a Weston standard voltmeter and the necessary portable voltmeters and ammeters.

The photographic laboratory is equipped with cameras and other appliances, dark-rooms, skylights, screens, and back grounds for portrait and copying work, and water facilities. The equipment enables the carrying forward of a very practical course in photograhpy in its various applications.

The dynamo laboratory equipment includes 26 dynamos for experimental purposes, among which are three 7½ K. W. 125 volt rotary converters, one 10 H. P. 220 volt 60 cycle 2-phase induction motor with a wound rotor and external variable resistance with controller, four single-phase alternators of 1, 10, 25 and 35 K. W. capacity, two arc light machines, one 45 K. W. Edison generator, one 25 H. P. four-pole 110 volt motor, one 7½ K. W., 220 volt, revolving field alternator for 1, 2, 3, 6 or 12 phases, one 10-H. P., 220 volt, 2 or 3 phase induction motor with internal resistance type rotor, two 7½ K. W., 125 volt, compound wound d. c. generators, one 10-H. P., 125 volt, inter-pole d. c. motor and several 2 and 3 H. P. series and shunt wound direct current machines. The instrument equipment of the laboratory consists of about 60 modern alternating and direct current voltmeters, ammeters and Wattmeters, a number of which are of the switch board type and are mounted at convenient points about the laboratory. The transformer equipment includes a number of modern types of transformers among which are two sets of transforming 3-phase to 2-phase or vice versa.

There are four switch boards in the laboratory, as follows: One containing the terminals of the circuits coming into the laboratory from the power station and from the physical laboratories; one containing instruments, circuit breakers, rheostats, synchronizing apparatus and terminals for the rotary converter set; one containing terminals and apparatus for the induction motor outfit; and one containing no instruments but having upon it jack terminals for 90 circuits which radiate to the other boards, to various convenient points about the laboratory and to a number of lamp banks on the walls; the purpose of this last board being to make it possible to connect together any circuits that may be desired.

There are also a considerable number of other pieces of apparatus, such as instantaneous contact makers, prony brakes, speed counters, inductance coils, tin resistance frames, water rheostats, etc.

In addition to this equipment, the student has access for experimental and test purposes, to the electric machinery of the College power house and lighting plant. Among other machines in this plant are two 15 K. W. Edison dynamos; one 30 K. W. Edison dynamo; one 15 K. W. 500 volt generator; one four-pole 18 K. W. compound-wound generator; one 15 K. W. alternator; one 30 K. W. alternator, and one 60 K. W. alternator. There is also a series of motors for driving the machinery of the Mechanical Engineering Department which range in size from five to twelve horse-power which are available for test purposes.

The repair shop is fitted with an engine lathe, a speed drill, a set of machinist's and carpenter's tools and a stock of shop supplies. This room is used for the repair and manufacture of apparatus.

COURSE IN ELECTRICAL ENGINEERING.

Academic Year.

Any student who at entrance presents satisfactory credit for part of the Academic course, or who by examination passes part of it satisfactorily, will be classified in such of the remaining work offered in the Academic year as the Dean of the Junior College and the Dean of Engineerng shall consider will best prepare him for his college course. After providing in such classification for the remainder of the thirty credits required for entrance to college, the student may complete his schedule by taking up some of the Freshman studies.

FIRST SEMESTER.

		Required semester hours
Mathematics 3,	Algebra	5
English 2,	Rhetoric and Composition	5
Modern Languages		

The Language selected must be carried through the entire year.

Language 1 Language 5, Language 30,	French 5 German 5 Spanish 5	5
Civics 1,	Government in State and Nation	2
Mechanical Engineering 19,	Perspective Drawing	1
	Total semester hours	18

SECOND SEMESTER.

		Required semester hours
Mathematics 5,	Plane Geometry	3
Mathematics 6,	Solid Geometry	2
Literature 12,	English Classics	4
Modern Languages		

The Language selected must be a continuation of the one chosen in the first semester.

Language 2, Language 6, Language 31,	French 5 German 5 Spanish 5	5
History 16,	The National Period	3
Mechanical Engineering 29,	Joinery and Wood Turning	1
	Total semester hours	18

**Freshman Year.

FIRST SEMESTER.

		Required semester hours
Mathematics 20,	Algebra	4
Mathematics 21,	Plane Trigonometry	1
Modern Languages		

The Language selected must be continued through the entire year.

Choice Language 18 or 57,	French 3	3
Language 20 or 73,	German 3	
Language 36 or 45,	Spanish 3	
English 10,	Narration and Description	3
Chemistry 41,	General Chemistry	3
Mechanical Engineering 130,	Shop Work	2
Electrical Engineering 101,	Technical Lecture	
Mechanical Engineering 121,	Mechanical Drawing	2
Military 1,	Military Drill	
	Total semester hours	18

SECOND SEMESTER.

		Required semester hours
Mathematics 22,	Trigonometry	2
Mathematics 23,	Analytical Geometry	3
Modern Languages		

The Language selected must be a continuation of the one chosen in the first semester.

Choice Language 19 or 58,	French 3	3
Language 21 or 74	German 3	
Language 37 or 46,	Spanish 3	
English 11,	Exposition	3
Chemistry 42,	General Chemistry	3
Mechanical Engineering 232,	Shop Work	2
Electrical Engineering 202,	Technical Lecture	
Civil Engineering 204,	Descriptive Geometry	2
Military 2,	Military Drill	
	Total semester hours	18

**Freshmen who show deficient preparation in English or Mathematics may be assigned by the Dean of the Junior College and the Dean of Engineering, to special classes, with one credit hour more work than indicated above, or in case of clear indication of failure, even with this arrangement; they may be assigned to Academic classes.

Sophomore Year.

FIRST SEMESTER.

		Required semester hours
Mathematics 24,	Analytical Geometry	2
Mathematics 25,	Calculus	3
English 12,	Argumentation	2
Chemistry 43,	Qualitative Analysis	3
Physics 303,	Mechanics and Heat	5
Mechanical Engineering 331,	Shop Work	2
Mechanical Engineering 322,	Mechanical Drawing	1
Military 3, or Athletics		
	Total semester hours	18
History 17,	The American People	1

To be taken in Sophomore or Junior year.

SECOND SEMESTER.

		Required semester hours
Mathematics 26,	Differential and Integral Calculus	4
Chemistry 45,	Analytical Chemistry	2
Physics 404,	Electricity and Magnetism and Light and Sound	5
Mechanical Engineering 437,	Shop Work	1
Mechanical Engineering 439,	Shop Work	1
Mechanical Engineering 401,	Analytical Mechanics	3
Mechanical Engineering 423,	Mechanical Drawing	2
Military 4, or Athletics		
	Total semester hours	18
History 18,	American Statesmen	1

To be taken in Sophomore or Junior year.

Junior Year.

FIRST SEMESTER.

		Required semester hours
Physics 506,	Electricity and Magnetism	3
Physics 514,	Physical Laboratory	2
Mechanical Engineering 502,	Analytical Mechanics	5
Mechanical Engineering 503,	Materials of Construction	3
Mechanical Engineering 533,	Shop Work	2
Mechanical Engineering 512,	Mechanical Engineering Laboratory	1
Mathematics 10,	Differential Equations	2
	Total semester hours	18

Optional:

English 7,	Debating	1
History 7,	America in the Far East	2
Civics 7,	Comparative Government	2
Literature 13,	Literature	2

SECOND SEMESTER.

		Required semester hours
Electrical Engineering 604,	Direct Current Machinery	4
Electrical Engineering 619,	Electrical Engineering Laboratory	1
Physics 607,	Theory of Alternating Currents	3
Physics 617,	Physical Laboratory	2
Mechanical Engineering 686,	Analytical Mechanics	4
Mechanical Engineering 605,	Machine Design	3
Mechanical Engineering 613,	Mechanical Engineering Laboratory	1
	Total semester hours	18

Optional:

English 8,	Debating	1
History 9,	The Far Eastern Question	2
Civics 7,	Comparative Government	2
Literature 14,	Literature	2

Senior Year.

FIRST SEMESTER.

For students graduating in 1910 and later. For course of study of graduates of 1909 see Catalog for 1907-1908.

		Required semester hours
Electrical Engineering 708,	Alternating Current Machinery	4
Electrical Engineering 713,	Principles of Telephony	1
Electrical Engineering 720,	Electrical Engineering Laboratory	2
Electrical Engineering 724,	Electrical Engineering Design	2
Electrical Engineering 729,	Electrical Engineering Seminar	
Mechanical Engineering 784,	Steam Engines and Boilers	2
Engineering 702,	Specifications and Contracts	1
Civil Engineering 751,	Surveying	3
Economic Science 9,	Outlines of Economics	3
Electrical Engineering	Thesis begun	
	Total semester hours	18

Optional:

History 7,	America in the Far East	2
Civics 7,	Comparative Government	2
Literature 13,	Literature	2
English 7,	Debating	1

SECOND SEMESTER.

		Required semester hours
Electrical Engineering 816,	Electric Power Plants and Transmission	3
Electrical Engineering 809,	Electric Railways	3
Electrical Engineering 821,	Electrical Engineering Laboratory	2
Electrical Engineering 825,	Electrical Engineering Design	2
Electrical Engineering 830,	Electrical Engineering Seminar	
Electrical Engineering 840,	Electrical Engineering Thesis	4
Mechanical Engineering 809,	Constructive Engineering	3
Engineering 801,	History of Engineering	1
	Total semester hours	18

Optional:

Economic Science 12,	Engineering Economics	2
History 9,	The Far Eastern Question	2
Civics 7,	Comparative Government	2
English 8,	Debating	1

COURSES IN PHYSICS.

205. Mechanics, Heat and Light. Required second semester Freshman year of all students in four year courses in the Division of Agriculture. A study of the fundamental principles of Physics and their applications. Lecture and recitations. Prerequisite, Mathematics 17. Three hours credit.

301. Mechanics and Heat. Required first semester Sophomore year in Domestic Economy and the choice between Physics 301 and 303 in the General Science Course. Includes study of mass, force, energy and power, also graphic methods of solving problems in force actions, velocities, etc., radiation in general and wave motion; also mechanics and heat. Prerequisites, Mathematics 4, 5, and 6. Three hours credit. Recitations and lectures.

303. Mechanics and Heat. Required first semester Sophomore year in all four year Engineering and a choice between this and 301 in the General Science Course and first semester of the second year in the two year courses in Clay Working and Mining Engineering. Study of the fundamental principles of the work, also study of vector quantities and their treatment. A view of the subject from the mathematical standpoint is emphasized and the student is urged to familiarize himself with the theoretical side of the question as it is believed that such a foundation is essential to the work which follows. Prerequisites, Mathematics 4, 5, and 6. Five hours credit. Lectures three hours, recitation one hour, and laboratory one period per week.

402. Electricity and Magnetism and Light and Sound. Required second semester Sophomore year in Domestic Economy and the choice between this study and 404 in the General Science Course. Includes study of electricity, magnetism, light and sound. This course together with course 301 is to meet the needs of the students in Domestic Economy. The breadth of the course, together with the emphasis which is placed upon the essentials, adapt it to the needs of teachers and others who desire a general training in physics. Prerequisite, Physics 301. Three hours credit. Lectures and recitations.

404. Electricity and Magnetism and Light and Sound. Required second semester Sophomore year in all four year Engineering Courses and a choice between this and 402 in the General Science Course, and elective Junior or Senior in all Agricultural Courses. Prerequisite, Physics 303. Five hours credit. Lectures three hours, recitation one hour, and laboratory one period per week.

506. Electricity and Magnetism. Required first semester Junior year in Mechanical and Electrical Engineering. Elementary theory of electricity and magnetism; discussion of measuring instruments and laboratory methods of measuring various electrical quantities. Lectures, recitations, and problems. Text-book, Nichols and Franklin, "Elements of Physics," Vol. II. Prerequisites, Physics 303 and 404, and Mathematics 26. Three hours credit.

509. Theory and Practice of Photography. Elective first semester Junior or Senior year in all Agricultural Courses. Elective first semester Junior or Senior year in all Science Courses (only upon recommendation by head of department in which student is taking his major work). Lecture, one hour and laboratory, one period per week.

514 Physical Laboratory. Required first semester Junior year in Electrical Engineering, elective first semester Junior or Senior year in Science Courses. Measurement of length, mass and time, determination of physical constants, use of barometer, thermometry, calorimetry, etc. Prerequisites, Physics 303 and 404 and Mathematics 26. Laboratory, two periods per week. Fee, $5.00.

516. Physical Laboratory, Elementary Physical Measurements. Elective first semester Junior or Senior year in Science Courses. Work as offered in Course 615. Laboratory, two periods a week. Fee, $5.00.

523. Physical Laboratory. Required first semester Junior year in Mechanical and Civil Engineering and Ceramics, and elective first semester Junior or Senior year in Science courses. Laboratory, one period per week. Fee, $3.00.

607. Theory of Alternating Currents. Required second semester Junior year in Electrical Engineering. Prerequisites, Physics 506 and Mathematics 10. Lectures and recitations, three hours per week.

615. Physical Laboratory, Elementary Physical Measurements. Required second semester Junior year in Mechanical Engineering, elective second semester Junior or Senior year in Science courses. Measurement of electro-motive force and internal resistance of primary and secondary batteries, use of Wheatstone's bridge, measurement of current, determination of galvanometer constants, high resistance measurements, insulation tests. Laboratory, one period per week. Fee, $3.00.

617. Physical Laboratory, Elementary Physical Measurements. Required second semester Junior year in Electrical Engineering, elective second semester Junior or Senior year in Science courses. Work as offered in Course 615. Laboratory, two periods per week. Fee, $5.00.

COURSES IN ELECTRICAL ENGINEERING.

101. Technical Lecture. Required first semester Freshman year in Electrical Engineering in connection with required Shop Work. Elementary principles of Electrical Engineering.

202. Technical Lecture. Required second semester Freshman year in Electrical Engineering in connection with required Shop Work. Continuation of Electrical Engineering 101.

503. Electric Power Transmission and Railways. Required first semester Junior year in Civil Engineering. An elementary study of the principles of electrical machinery and the transmission and distribution of power for industrial purposes, including power plants, transmission lines and electric railways. Prerequisites, Physics 303 and 404, and Mathematics 26. Two hours per week.

604. Direct Current Machinery. Required second semester Junior year in Electrical Engineering. General theory of the direct-current dynamo, the establishment of electro-motive forces by induction, the magnetic circuit, armature windings, characteristic curves, and the adaption of the different types of direct-current machinery to various commercial purposes is included. Text, Franklin and Esty's "Elements of Electrical Engineering." Prerequisite, Physics 506. Lectures and recitations, four hours per week.

610. Direct Current Machinery. Required second semester Junior year in Mechanical Engineering. Same topics as in Electrical Engineering 604, but with less detail. Prerequisite, Physics 506. Textbook, Franklin and Esty's "Elements of Electrical Engineering." Recitations, three hours per week.

619. Electrical Engineering Laboratory. Required second semester Junior year in Electrical Engineering course. Elementary experiments on direct current circuits, machines and instruments. Must be preceded by Physics 517 and accompanied by Electrical Engineering 604. Laboratory, one period per week. Fee, $3.00.

708. Alternating Current Machinery. Required first semester Senior year in Electrical Engineering. Study of alternating current generators, motors, transformers, etc. Prerequisites, Physics 607 and Electrical Engineering 604. Lectures and recitations. Four hours per week.

712. Electric Power Transmission and Mining. Required first semester Senior year in Mining Engineering. A study of the application of electrical machinery to industrial purposes, including electrical transmission and mining. Prerequisites, Physics 303 and 404 and Mathematics 26. Lectures and recitations, three hours per week.

713. Telephony. Required first semester Senior year in Electrical Engineering. General study of telephony, the telephone, telephone lines, and commercial apparatus. Prerequisite, Physics 607. Lecture, one hour per week.

717. Electrical Engineering Laboratory. Required first semester Senior year in Mechanical Engineering Course. Study of direct current machinery. Prerequisite, Electrical Engineering 604. Laboratory, one period per week. Fee, $3.00.

720. Electrical Engineering Laboratory Required first semester Senior year in Electrical Engineering course. Advanced study of direct current machinery operation and beginning study of alternating current circuits and instruments. Must be accompanied or preceded by Electrical Engineering 708. Prerequisites, Electrical Engineering 604 and 619. Laboratory, two periods per week. Fee, $5.00.

724. Electrical Engineering Design. Required first semester Senior year in Electrical Engineering. The design of direct current generators. Prerequisite, Electrical Engineering 604. Two afternoons per week.

729. Electrical Engineering Seminar. Required first semester Senior year in Electrical Engineering. Consists of preparation, presentation and discussion of papers upon special assigned topics in Electrical Engineering. Papers must be carefully written and submitted to professor in charge.

809. Electric Railways. Required second semester Senior year in Electrical Engineering. A study of electric railway systems and apparatus, including the design of feeders and trolleys and the determination of the proper equipment for a given service. Prerequisite, Electrical Engineering 708. Lectures and recitations, three hours per week.

815. Alternating Current Machinery. Required second semester Senior year in Mechanical Engineering. Same topics as Electrical Engineering 708, but with less detail. Prerequisite, Electrical Engineering 610. Lectures and recitations, three hours per week.

816. Electric Power Plants and Transmission. Required second semester Senior year in Electrical Engineering. A study of the principles underlying the lay out of power-house and switchboard circuits and of distributing systems, including the determination of the most economical size of conductors for such systems, taking into account current prices f materials, rates of interest and depreciation, and cost of power, also umerous original and practical problems illustrating the principles. Pre-equisite, Electrical Engineering 708. Lectures and recitations, three ours per week.

818. Electrical Engineering Laboratory. Required second se-nester, Senior year, in Mechanical Engineering. Study of alternating urrent circuits and machinery. Prerequisite, Electrical Engineering 717. Must be accompanied by Electrical Engineering 815. Laboratory, one period per week. Fee, $3.00.

821. Electrical Engineering Laboratory. Required second semester Senior year in Electrical Engineering. Continuation of Course 720. Study of alternating current generators and motors, and commercial transformers. Laboratory, two periods per week. Fee, $5.00.

825. Electrical Engineering Design. Required second semester Senior year in Electrical Engineering. The design of alternating current generators and transformers. Prerequisite, Electrical Engineering 724. Two afternoons per week.

830. Electrical Engineering Seminar. Required second semester Senior year in Electrical Engineering. Continuation of Course 729.

840. Electrical Engineering Thesis. Required second semester Senior year in Electrical Engineering. Preparation of a thesis on some Electrical Engineering subject—the designing and construction of some electrical machine or measuring instrument, the efficiency test and critical study of some dynamo-electric machine or power plant, or of electrical research work of special direction. Four hours credit per week.

DEPARTMENT OF MINING ENGINEERING.

SAMUEL WALKER BEYER, PROFESSOR.
LAURENCE C. HODSON AND IRA A. WILLIAMS, ASSOCIATE PROFESSORS.
C. E. ELLIS, INSTRUCTOR.

The courses in Mining Engineering are planned to give the student a ready familiarity with the branches which form the ground work of science of Mining and Metallurgy. The Department of Mining Engineering aims to give him such a thorough training in the fundamentals as will enable him after graduation to acquire in a comparatively short time the practical experience absolutely necessary before he is fitted to assume positions of great responsibility in the mining industries. The department offers two courses, a four years', and a two years' course. The first is intended for those students who desire a "thorough course in Theoretical and Practical Mining," and underlying sciences, and leads to the degree of Bachelor of Science in Mining Engineering. The requirements for admission are the same as those for admission to the other Engineering courses. Students who pursue this course to completion are expected to be able to undertake the "full management of mining in its various branches," and become familiar with the principles involved and the methods employed in good mining engineering practice in general.

The latter course is designed for young men who have had some practical experience in mines, and wish to study mine surveying, drafting, the problems of ventilation, drainage, haulage, mine operation, etc., and also to learn something of the sciences which bear upon their work but have neither the time nor the preparation for a full college course. Elementary mathematics, drawing and shop work receive considerable attention during the first year, while the professional studies are reserved for the second year. Candidates who are twenty-one years of age or over are admitted without examination. All others must give evidence of a thorough grounding in the common branches.

Equipment.

The Department of Mining Engineering occupies six rooms on the third floor and three on the first floor of Engineering Hall and shares in common with the other Engineering departments the blue print, photographic, Engineering Museum and Assembly rooms. Of the rooms used exclusively by the Department of Mining Engineering, three are used for laboratory purposes only, two for laboratory and lecture purposes, one as a museum, and three afford space for supplies, instruments, books and filing cases, *in addition to their use for* office purposes.

Lecture Room and Laboratory in Mining Engineering.—This room is provided with seventy-five opera chairs with folding arm rests, a wall table cabinet occupying all of the outside wall space and so arranged as to provide excellent working space in front of the windows while the space between the windows is utilized for the filing of study material. Above the wall table, lockers with glass doors are provided, in which students may keep books and small pieces of apparatus free from dust. The windows are all provided with opaque shades and the room with a permanent lantern screen. The balance of the interior wall space is occupied by slate blackboards. A large cabinet lecture table completes the equipment of the room.

Seminar Room.—The seminar room is used for both laboratory and lecture purposes as in the case of the preceding, in addition to serving as a conference room and headquarters for the Junior and Senior students in Mining Engineering. It is equipped with two long tables standing at right angles to and directly connected with a large cabinet lecture table, the whole forming a continuous table in the form of a U. The room has a seating capacity of thirty-six and is equipped with movable revolving chairs, and slate blackboards on the interior walls. In addition the room contains a twenty-two tray filing case for large drawings, plats and maps, and a supply case.

Metallurgical Laboratories.—The laboratories for Metallurgy and Ceramics are located on the ground floor and are fitted with soapstone topped cabinet wall tables occupying all the outside walls and a large fume chamber, supply and display cases. They are supplied with water, gas, compressed air, exhaust and electrical connections. They already contain a Hoskin's No. 4 muffle furnace and a Bosworth assay furnace with the usual accessories for doing metallurgical and ceramic work and several smaller furnaces.

The Museum.—The museum for Geology and Mining Engineering is fitted with eight museum cases with sloping glass tops and cabinet bases. The bases supply room for one hundred and ninety-two trays in which the working collections and duplicate material in Geology and Mineralogy are filed. One large central case containing the larger casts of the "Ward Series," a series of cases, showcase tops and cabinet bases, occupy the space between the windows, and permanent cases occupy all the partition wall space.

The offices supply room for apparatus, supplies, books, and filing cases.

The department is supplied with a Sullivan core drill with a complete set of tools and accessories for carrying on actual field operations, a "Queen" Light Mountain mining transit; two "Berger" No. 4 Mining transits with interchangeable side and top telescopes; a Brunton pocket transit; a sensitive six-dial anemometer reading to ten millions of feet; rods and sighting poles; a set of miner's tools; barometers, clinometer, a series of miner's lamps and various instruments used in ascertaining distances.

The department has received through the generosity of the J. George Leyner Engineering Works of Denver, Colorado, one Water Leyner Rock Drill with column, condenser, and full complement of steel.

The laboratory in Metallurgy and Ceramics possessses aside from the list of utensils to be found in any well equipped laboratory for these branches of chemical work, the following special pieces of apparatus: Weatherhead mortar and porcelain mortars for pulverizing; forty-four brass brickette molds, chemical balances, torsion balance; Le Chatelier thermo-electric pyrometer; a Seger volumeter; two-jar ball-mill, Sturtevant laboratory crusher; and sample grinder.

Ames is located conveniently to the Iowa coal fields and students have easy access to the coal mines of Boone and Polk counties. The great centers of the clay industry, Des Moines, Boone, and Fort Dodge, are equally accessible, while the quarries of Marshall county are scarcely more than an hour's ride from the College. These and numerous allied industries are, after all, the most important and indispensable laboratories for the practical mining engineer. The department undertakes to present the accepted theories concerning mineral aggregation, origin and occurrence, but these theories can be put to test only by an intelligent use of the drill, the level and the plane table. The accredited methods of winning the ores and minerals receive full discussion in the class room, but only render obvious the necessity of becoming familiar with the practical workings of the sluice box, the tipple and the stamp mill.

The chemical and physical properties of a clay may be ascertained in the laboratory, but a complete knowledge of its properties and its mode of treatment can be gained only by following it from the pit to the street. In short, the department aims to give as complete an exposition of the theories and laws which underlie the science of mining as the time will permit, but the verification and application of these theories and laws must be made, in large measure, in the field and in the industries.

It is the settled policy of the department to carry on such investigation work as may be of benefit to the mining and manufacturing interests of the state. In coöperation with the other Engineering departments considerable work has been done and is being done on fuels, clays and structural materials. The department is also prepared to do a limited amount of assaying, test clays and fuels, do mine surveying, prepare mine maps and plats, examine and report on mine and clay properties for citizens of the state at reasonable cost. In fact the atmosphere produced by *practical investigation work,* is believed to be necessary to the healthful growth of the engineer, and no opportunity is lost to encourage work along these lines.

Courses in Mining.

The work of the first two years in the four years' course in Mining Engineering is exactly the same as that required in the course in Mechanical Engeering, with the exception that Surveying takes the place of Mechanical Drawing, and the technical lecture is along mining engineering lines. The professional studies are given due prominence during the last two years of the course and the student is required to take continuous work in mining, chemistry and metallurgy, and geology, through the last three semesters. He is expected to make one of these branches the subject of special investigation and to embody the results of such investigation in a thesis, which is required of every student who is a candidate for graduation.

It is generally recognized that there is of necessity a considerable gap between the work included in the College curriculum and that of the professional engineer; and that the student in Engineering must gain the larger part of his professional training outside of college walls. The courses in summer field work are offered in the hope that his apprenticeship may be reduced to a minimum, and are required of all students in the four years' course in Mining Engineering.

COURSE IN MINING ENGINEERING.

Academic Year.

Any student who at entrance presents satisfactory credit for part of the Academic course, or who by examination passes part of it satisfactorily, will be classified in such of the remaining work offered in the Academic year as the Dean of the Junior College and the Dean of Engineering shall consider will best prepare him for his college course. After providing in such classification for the remainder of the thirty credits required for entrance to college, the student may complete his schedule by taking up some of the Freshman studies.

FIRST SEMESTER.

			Required semester hours
	Mathematics 3,	Algebra	5
	English 2,	Rhetoric and Composition	5
	Modern Languages		
	The Language selected must be carried through the entire year.		
Choice	Language 1,	French 5	5
	Language 5,	German 5	
	Language 30,	Spanish 5	
	Civics 1,	Government in State and Nation	2
	Mining Engineering 21,	Elements of Mining	1
		Total semester hours	18

SECOND SEMESTER.

			Required semester hours
	Mathematics 5,	Plane Geometry	3
	Mathematics 6,	Solid Geometry	2
	Literature 12,	English Classics	4
	Modern Languages		
	The Language selected must be a continuation of the one chosen in the first semester.		
Choice	Language 2,	French 5	5
	Language 6,	German 5	
	Language 31,	Spanish 5	
	History 16,	The National Period	3
	Mining Engineering 22,	Elements of Mining	1
		Total semester hours	18

****Freshman Year.**

FIRST SEMESTER.

		Required semester hours
Mathematics 20,	Algebra	4
Mathematics 21,	Plane Trigonometry	1

**Freshmen who show deficient preparation in English or Mathematics may be assigned by the Dean of the Junior College and the Dean of Engineering, to special classes, with one credit hour more work than indicated above, or in case of clear indication of failure, even with this arrangement, they may be assigned to Academic classes.

Modern Languages

The Language selected must be carried through the entire year.

Choice	Language 18 or 57,	French	3	3
	Language 20 or 73,	German	3	
	Language 36 or 45,	Spanish	3	

English 10,	Narration and Description	3
Chemistry 41,	General Chemistry	3
Mechanical Engineering 130,	Shop work	2
Mining Engineering 101,	Principles of Mining	
Mechanical Engineering 121,	Mechanical Drawing	2
Military 1,	Military Drill	
	Total semester hours	18

SECOND SEMESTER.

		Required semester hours
Mathematics 22,	Trigonometry	2
Mathematics 23,	Analytical Geometry	3

Modern Languages

The Language selected must be a continuation of the one chosen in the first semester.

Choice	Language 19 or 58,	French	3	3
	Language 21 or 74,	German	3	
	Language 37 or 46,	Spanish	3	

English 11,	Exposition	3
Chemistry 42,	General Chemistry	3
Mechanical Engineering 331,	Shop work	2
Mining Engineering 220,	Principles of Mining	
Civil Engineering 204,	Descriptive Geometry	2
Military 2,	Military Drill	
Mining Engineering 212,	Summer field work	

Students who secure remunerative employment during their summer vacations between Freshman-Sophomore and Sophomore-Junior years will be excused from summer field work providing they are so employed for one month, subject to the approval of the heads of the department.

Total semester hours	18

Sophomore Year.

FIRST SEMESTER.

		Required semester hours
Mathematics 24,	Analytical Geometry	2
Mathematics 25,	Calculus	3

English 12,	Argumentation	2
Chemistry 43,	Qualitative Analysis	3
Physics 303,	Mechanics and Heat	5
Civil Engineering 345,	Surveying	2
Mechanical Engineering 322,	Mechanical Drawing	1
Mining Engineering 318,	Journal Club	
Military 3, or Athletics		
	Total semester hours	18
History 17,	The American People	1

To be taken in Sophomore or Junior year.

SECOND SEMESTER.

		Required semester hours
Mathematics 26,	Differential and Integral Calculus	4
Chemistry 46,	Elementary Quantitative Analysis	4
Physics 404,	Electricity and Magnetism and Light and Sound	5
Mechanical Engineering 401,	Analytical Mechanics	3
Civil Engineering 446,	Surveying	2
Mechanical Engineering 483,	Mechanical Drawing	1
Mining Engineering 419,	Journal Club	
Military 4, or Athletics		
Mining Engineering 423,	Summer Field Work	

Students who secure remunerative employment during their summer vacations between Freshman-Sophomore and Sophomore-Junior years will be excused from summer field work providing they are so employed for one month, subject to the approval of the heads of the department.

	Total semester hours	18
History 18,	American Statesmen	1

To be taken in Sophomore or Junior year.

Junior Year.

FIRST SEMESTER.

		Required semester hours
Mechanical Engineering 502,	Analytical Mechanics	5
Mining Engineering 510,	Mine Surveying and Mining Law	4
Geology 501,	Geology	4
Chemistry 48,	Chemistry	4

Mechanical Engineering 512,	Mechanical Engineering Laboratory	1
Mining Engineering 506,	Seminar	
	Total semester hours	18

Optional:

English 7,	Debating	1
History 7,	American in the Far East	2
Economic Science 9,	Outlines of Economics	3
Civics 7,	Comparative Government	2
Literature 13,	Literature	2

SECOND SEMESTER.

		Required semester hours
Mechanical Engineering 686,	Analytical Mechanics	4
Geology 607,	Geology	4
Mining Engineering 614,	Metallurgy	4
Mining Engineering 602,	Principles of Mining	3
Civil Engineering 656,	Structural Engineering	3
Mining Engineering 607,	Seminar	
Mining Engineering 613,	Summer Field Work	

Junior students who secure instructive employment in one of the great metal mining districts of the country will be excused from the Junior summer field work, providing they are so employed for at least six weeks subject to the approval of the head of the department.

Total semester hours 18

Optional:

English 8,	Debating	1
History 9,	The Far Eastern Question	2
Economic Science 9,	Outlines of Economics	3
Economic Science 12,	Engineering Economics	2
Civics 7,	Comparative Government	2
Literature 14,	Literature	2

Senior Year.

FIRST SEMESTER.

For students graduating in 1910 and later. For course of study of graduates of 1909 see Catalog for 1907-1908.

		Required semester hours
Mining Engineering 715,	Metallurgy	4
Mining Engineering 703,	Principles of Mining	4

Geology 704,	Geology	4
Mechanical Engineering 784,	Steam Engines and Boilers	2
Engineering 702,	Specifications and Contracts	1
Electrical Engineering 712,	Electric Power Transmission and Mining	3
Mining Engineering 708,	Seminar	
Mining Engineering	Thesis begun	
	Total semester hours	18

Optional:

English 7,	Debating	1
History 7,	America in Far East	2
Economic Science 9,	Outlines of Economics	3
Economic Science 12,	Engineering Economics	2
Civics 7,	Comparative Government	2
Literature 13,	Literature	2

SECOND SEMESTER.

For students graduating in 1910 and later. For course of study of graduates of 1909 see Catalog for 1907-1908.

				Required semester hours
	Mining Engineering 804,	Mining		5
	Geology 805,	Geology		4
	Engineering 801,	History of Engineering		1
	Mechanical Engineering 809,	Constructive Engineering		3
	Thesis work			
Choice	Mining Engineering 816,	Special work in Metallurgy	5	5
	Mining Engineering 817,	Special work in Mining	5	
	Geology 808,	Special work in Geology	5	
	Mining Engineering 809,	Seminar		
		Total semester hours		18

Optional:

English 8,	Debating	1
History 9,	The Far Eastern Question	2
Economic Science 12,	Engineering Economics	2
Civics 7,	Comparative Government	2
Literature 14,	Literature	2

TWO YEAR COURSE IN MINING ENGINEERING.

First Year.

FIRST SEMESTER.

		hours Required semester
Mathematics 3,	Algebra	5
Mathematics 5,	Plane Geometry	5

Chemistry 21,	Elementary Experimental Chemistry	5
Mechanical Engineering 121,	Mechanical Drawing	2
Mechanical Engineering 130,	Shop work	2
Mining Engineering 101,	Principles of Mining	
	Total semester hours	19

SECOND SEMESTER.

		Required semester hours
Mathematics 6,	Solid Geometry	2
Mathematics 30,	Plane Trigonometry	3
Chemistry 23,	Elementary Experimental Chemistry	5
Mining Engineering 602,	Principles of Mining	3
Civil Engineering 204,	Descriptive Geometry	2
Mechanical Engineering 331,	Shop work	2
Mining Engineering 220,	Principles of Mining	
	Total semester hours	17

Second Year.

FIRST SEMESTER.

		Required semester hours
Chemistry 48,	Assaying	4
Civil Engineering 345,	Surveying	2
Mining Engineering 703,	Principles of Mining	4
Physics 303,	Mechanics and Heat	5
Mining Engineering 506,	Seminar	
	Total semester hours	15

SECOND SEMESTER.

		Required semester hours
Civil Engineering 446,	Surveying	2
Mining Engineering 804,	Mining Engineering	4
Mining Engineering 614,	Metallurgy	4
Geology 501,	General Geology	4
Mechanical Engineering 423,	Mechanical Drawing	2
Mining Engineering 607,	Seminar	
	Total semester hours	16

COURSES IN MINING ENGINEERING.

21. Elements of Mining. Required first semester Academic year in Mining Engineering and Ceramics Courses. One hour credit.

22. Elements of Mining. Required second semester Academic year in Mining Engineering and Ceramics Courses. One hour credit.

101. Principles of Mining. Required first semester Freshman year in Mining Engineering and Ceramics and two year courses in Mining Engineering and Clay Working in connection with the required Shop Work. The student receives instruction in the general and elementary principles of mining in order that he may appreciate something of what he sees and hears before he makes a detailed study of prospecting, exploration, mining methods, and the various subjects included in Courses 602, 703 and 804. Special attention given to mining terms and local mining methods.

212. Summer Field Work in Mine Surveying. Two weeks work required at the close of the Freshman year. The work is carried on in one of the coal mining districts of the state and comprises the complete survey of a mine and a thorough examination of the equipment and mode of operation of a typical mine for the district, and leads in the first place to a mine map, and in the second to a careful report on mine property accompanied by the necessary illustrations.

220. Principles of Mining. A continuation of Course 101. Required second semester Freshman year in Mining Engineering and Ceramics and Two Year courses in Mining Engineering and Clay Working in connection with the required Shop Work. The Mining and Metallurgical operations to be seen while on the succeeding Summer Field Trip are studied with as much detail as the time and student's preparation permit.

318. Journal Club. Required first semester Sophomore year in Mining Engineering Course and Ceramics. The work consists of weekly conferences with one or more of the instructors in the department, in which the leading mining journals receive principal attention. Lectures are given occasionally on current topics and the students are encouraged to acquire the habit of reading the technical journals which are to be found on the library shelves.

419. Journal Club. Required second semester Sophomore year in Mining Engineering Course and Ceramics. See Course 318. Continuation of 318.

423. Summer Field Work in Mine Surveying. Two weeks work required at the close of the Sophomore year. The work is carried on in one of the coal mining districts of the state, and comprises the complete survey of a mine and a thorough examination of the equipment and mode of operation of a typical mine for the district, and leads in the first place to a mine map, and in the second to a careful report on mine property accompanied by the necessary illustrations.

506. Seminar. Required first semester Junior year in Mining Engineering and Ceramics and first semester second year in Two Year courses in Clay Working and Mining Engineering. For the purpose of bringing together the Junior and Senior students and the members of the instructing corps for weekly conferences. A discussion of timely topics by the students.

510. Mine Surveying and Mining Law. Required first semester Junior year in Mining Engineering. Supplements the work in surveying taken in the Civil Engineering Department. Methods of surveying especially adapted to mines and tunnels. The use of the auxiliary telescope and the various problems met with in underground surveying are illustrated by means of problems taken from actual practice. Also Mineral Land Surveying. As the subject of Mineral Land Surveying necessarily requires some knowledge of the law relating to mining claims, the whole subject of Mining, Mineral and Geological Law is given a rapid review. While an exhaustive study of such laws is impossible the necessity of some knowledge of the law is impressed upon the student and he is shown where he can obtain information on the simpler questions. Recitations, four hours per week.

602. Principles of Mining. Required second semester Junior year in Mining Engineering and second semester of first year in Two Year course in Mining Engineering. Study of methods employed in excavating, boring and shaft sinking, mining and the support of mine excavations; also critical study of methods employed in exploration, development and mine working in general. Recitations, three hours per week.

607. Seminar. Required second semester Junior year in Mining Engineering and Ceramics and second semester second year in Two Year courses in Clay Working and Mining Engineering. Continuation of Course 506.

613. Summer Field Work in the Study of Mine Operation and Equipment, and of Concentrating Plants. Four weeks' work required of students who have completed the Junior year. This course necessitates a visit to one of the great metal producing centers outside of the state. A careful study of mine properties is made, and a detailed report, properly illustrated by sketches and drawings, is required. A portion of the time is devoted to a study of ore dressing and concentrating plants.

614. Metallurgy. Required second semester Junior year in Mining Engineering and Ceramics and second semester of second year in Two Year course in Mining Engineering. Study of refractory materials, fluxes, fuels and furnaces and the metallurgy of iron and steel; also pyrometry, calorimetry, fire clays and coke; the various metallurgical furnaces studied from working drawings; also an introduction to the science of metallography. Recitations, four hours per week.

703. Principles of Mining. Required first semester Senior year in Mining Engineering and first semester second year in Two Year course in Mining Engineering. Continuation of Course 602, with special reference to Mining Machinery. The subjects of Haulage, Hoisting, Ventilation, Air Compressors, etc., are studied with as much detail as time permits. Recitations, four hours per week.

708. Seminar. Required first semester Senior year in Mining Engineering and Ceramics. Continuation of Courses 506 and 607.

715. Metallurgy. Required first semester Senior year in Mining Engineering. Study of processes relating to copper, lead, silver and zinc. In the time allotted to the work, a study of metallurgy of all the metals could not be made satisfactorily, and it is deemed best to confine the work to the most important metals and the most important processes. Recitations, four hours per week.

804. Mining Engineering. Required second semester Senior year in Mining Engineering, and second semester second year in Two Year course in Mining Engineering. Ore dressing, amalgamation, cyamdation, mine buildings and general equipment and administration of mines. Recitations and lectures, five hours per week.

809. Seminar. Required second semester Senior year in Mining Engineering and Ceramics. Continuation of Courses 506, 607 and 708.

816. Mining Engineering. Optional second semester Senior year in the four year course in Mining Engineering. Mine Examinations and Reports, Mine Accounting, Mine Plant Design. A comparative study of Mine Plants, New Concentration Methods, etc. These and kindred subjects will be taken up though not all during any one year. Instruction by means of lectures, assigned reading and reports. After preliminary work of this character, the student will be required to make designs and reports covering given problems. Students electing this work will be expected to write their graduating thesis on subjects introduced in this course. Five hours per week.

817. Metallurgy. Optional second semester Senior year, in the four year course in Mining Engineering. Intended for students who desire to specialize as much as possible in metallurgy. The subjects will be varied from year to year to suit the needs of the individual students. Instruction given by means of assigned readings, conferences and reports carried on simultaneously with work in the laboratory. Those electing this work will be required to write their graduating thesis on subjects introduced in this course. Five hours per week.

COURSES IN GEOLOGY.

501. General Geology: Dynamic, Structural and Physiographic Geology. Required first semester Junior year in Mining Engineering and Ceramics, and elective first semester Junior or Senior years in all Science and Agricultural courses. The course includes a study of the principles which form the groundwork of the Science and is given by means of recitations, lectures, laboratory and field work. Counts four hours per week, three of which are devoted to recitations and lectures, and one to laboratory and field work. Prerequisites, one or more semesters each of Chemistry and Physics. Text-book, Scott's Introduction to Geology, 2nd edition.

607. Mineralogy. Required second semester Junior year in Mining and elective second semester Junior or Senior year in all courses in Science and Agriculture. The first half of the term is devoted to a study of the morphological and physical characters of crystalline substances, while the last half is devoted to descriptive and determinative mineralogy. The course counts four hours and consists of four two hour sessions. Prerequisites, elementary courses in Mathematics, Chemistry and Physics.

704. Petrologic and Advanced Structural Geology. Required first semester Senior year in Mining Engineering and Ceramics Courses, and elective in all courses in Science and Agriculture. The first ten weeks of the term are devoted to the study of rocks, their origin, occurrence and association, and the last six weeks to a discussion of principles and problems in Structural Geology. The course counts four hours per week and includes three hours class work and one laboratory or field period per week. Prerequisites, Geology 501 or 803. Four hours credit.

803. Engineering Geology. Required second semester Senior year in the course in Civil Engineering. The course includes a discussion of the fundamental principles of dynamic and structural geology and a study of the common minerals and rocks, especially those important in structural materials. Counts three hours per week and consists of recitations, lectures, laboratory and field work. Prerequisites, Elementary Chemistry, Mechanics and Heat. Text-book, Scott's Introduction to Geology, 2nd Edition.

805. Economic Geology. Required second semester Senior year in Mining Engineering and Ceramics Courses and elective in all Science and Agricultural Courses. The first ten weeks includes a study of the non-metallics while the remainder of the term is devoted to a study of the ore deposits of the United States, Canada, and Mexico. Especial stress is put upon the principles which govern the mode of occurrence, association and origin of the leading economic products. Prerequisites, Geology 501 or 803, and 704. Counts four hours and consists of three recitations and one laboratory or field period per week. Four hours credit.

808. Thesis. Students in Mining Engineering electing to write a thesis in geology are required to take five hours special work in geology during the second semester Senior year. This special work may be along any one of the following lines: Economic Geology, Petrology, Dynamic Geology, Structural Geology, Metamorphism, Historical Geology or Stratagraphic Geology.

UNIVERSITY OF ILLINOIS
PRESIDENT'S OFFICE

CERAMICS AND CLAY WORKING

The Department of Ceramics is established in the College in response to a growing demand for instruction in the silicate industries. The continued development of the clay working interests and the notable recent expansion along all lines of the cement industry have created a demand for technically educated men who are equipped to take the lead in the utilization of the silicate raw materials. Inquiries for qualified men along these lines have come from various sources but at the present time the demand is far greater than the supply.

The term "Ceramics" has come to include within its scope the several phases of that branch of engineering which has to do with the investigation and development of all materials which enter into any of the silicate products. Besides clay and cement, therefore, glass-making, sandlime brick manufacture and all mortar work into which natural silicates or silicate forming processes enter are properly embraced in the definition of the word.

The ceramic processes proper are pre-eminently a phase of chemical engineering and depend upon the principles of technical chemistry. Along with this application of chemical principles must go, however, a thorough familiarity with good mechanical engineering practice and in this line a knowledge of surveying and the principles of electricity is also essential. The ceramist must likewise possess a knowledge of geology which will enable him to intelligently prospect for raw materials and to take advantage of geological features in their utilization. An acquaintance with metallurgical principles, especially those relating to the value of fuels and their combustion and the properties of slags is indispensible, for upon the application of this knowledge may frequently depend the success, or failure of large enterprises.

It is the design of the course in Ceramics to prepare and equip engineers to (a) intelligently exploit deposits of suitable raw materials, (b) to comprehend and apply economical methods to the winning of such materials, (c) to design and put into operation plants for their utilization and, (d) to take responsible charge of any and all technical processes connected with the manufacture of the finished products. To accomplish this, not only are the principles laid down in the class room and theories explained but these principles and theories are verified and applied in the laboratory and in the field. Students are also required to study the methods employed in some of the leading establishments of the state and are encouraged to spend their vacations in practical work at some of these plants.

The Iowa Brick and Tile Association while in session at Sioux City in 1899 passed a resolution requesting the trustees of the College to take up the investigation of the clays and the clay industries of the state. Similar resolutions were passed at each succeeding annual convention of the association. In 1906 both the Iowa Brick and Tile Association and the Iowa Cement Users Association passed resolutions favoring the establishment of a "School of Ceramics" and providing for the investigation of the raw materials available for the silicate industries. Each organization appointed a committee to take the matter before the legislature then in session and secure the necessary legislation.

After a conference of the joint committee in Des Moines the following bill was prepared, presented to the legislature, and passed by that body:

To provide for the establishment of a course of practical and scientific instruction and investigation in the art of clay working and ceramics including the manufacture and use of cements and allied industries in the Iowa State College of Agriculture and Mechanic Arts.

Section 1. Be it enacted by the general assembly of the State of Iowa that the Trustees of the Iowa State College of Agriculture and Mechanic Arts be, and are hereby required to establish in said college a department of ceramics for the technical and practical education of clay workers, cement manufacturers and other allied pursuits in all branches of those arts which exist in this state and can be profitably introduced and maintained in this state from the mineral resources thereof; including the geology and properties of clays, cement materials, feuls, and other minerals required, and the testing of the products thereof; also the manufacture of fire brick, pressed brick, paving brick, and the glazed and enameled brick of all kinds, of sewer pipe, drain tile, fire proofing and terra cotta, of pottery, porcelain, china, and other specialties; also including the details of the manufacture and uses of cement and the details of other allied industries.

Section 2. Be it further enacted, that the said College shall provide as a part of its Engineering Experiment Station work for the investigation of clays, cement materials, fuels, and other mineral resources of the state with especial reference to their economic uses, and for the publication and dissemination of information useful to such industries and for testing the products thereof.

At the 1907 and 1908 meetings of the Brick and Tile Association and the Iowa Association of Cement Users, strong resolutions were again passed favoring the development of ceramic investigations and the support by the state of a department of instruction in this line of work.

In accordance with the spirit of the act establishing the department it is the desire to continue in co-operation with the Engineering Experiment Station the investigation of promising deposits of raw materials in different parts of the state. It is the policy of the department to serve the interests of the people of the state and to carry on such experiments as may seem required to determine the suitability of materials that appear to be available for any ceramic purpose.

Courses in Ceramics.

Two courses are offered in Ceramics; a two year and a four year course. The shorter course is the equivalent of the short course in

Mining Engineering while the longer course is co-ordinate with the four year courses offered in Mechanical, Civil, Electrical and Mining Engineering.

COURSE IN CERAMICS.

Academic Year.

Any student who at entrance presents satisfactory credit for part of the Academic course, or who by examination passes part of it satisfactorily, will be classified in such of the remaining work offered in the Academic year as the Dean of the Junior College and the Dean of Engineering shall consider will best prepare him for his college course. After providing in such classification for the remainder of the thirty credits required for entrance to college, the student may complete his schedule by taking up some of the Freshman studies.

FIRST SEMESTER.

		Required semester hours
Mathematics 3,	Algebra	5
English 2,	Rhetoric and Composition	5
Modern Languages The Language selected must be carried through the entire year.		
Choice Language 1, Language 5, Language 30,	French 5 German 5 Spanish 5	5
Civics 1,	Government in State and Nation	2
Mining Engineering 21,	Elements of Mining	1
	Total semester hours	18

SECOND SEMESTER.

		Required semester hours
Mathematics 5,	Plane Geometry	3
Mathematics 6,	Solid Geometry	2
Literature 12,	English Classics	4
Modern Languages The Language chosen must be a continuation of the one chosen in the first semester.		
Choice Language 2, Language 6, Language 31,	French 5 German 5 Spanish 5	5
History 16,	The National Period	3
Mining Engineering 22,	Elements of Mining	1
	Total semester hours	18

****Freshman Year.**

FIRST SEMESTER.

		Required semester hours
Mathematics 20,	Algebra	4
Mathematics 21,	Plane Trigonometry	1
Modern Languages		

The Language selected must be continued through the entire year.

Choice Language 18 or 57,	French 3	
Language 20 or 73	German 3	3
Language 36 or 45,	Spanish 3	
English 10,	Narration and Description	3
Chemistry 41,	General Chemistry	3
Mechanical Engineering 130,	Shop Work	2
Mechanical Engineering 121,	Mechanical Drawing	2
Mining Engineering 101,	Principles of Mining	
Military 1,	Military Drill	
	Total semester hours	18

SECOND SEMESTER.

		Required semester hours
Mathematics 22,	Trigonometry	2
Mathematics 23,	Analytical Geometry	3
Modern Languages		

The Language selected must be a continuation of the one chosen in the first semester.

Choice Language 19 or 58,	French 3	
Language 21 or 74,	German 3	3
Language 37 or 46,	Spanish 3	
English 11,	Exposition	3
Chemistry 42,	General Chemistry	3
Mechanical Engineering 331,	Shop Work	2
Mining Engineering 220,	Principles of Mining	
Civil Engineering 204,	Descriptive Geometry	2
Military 2,	Military Drill	
Mining Engineering 212,	Summer Field Work	

Students who secure remunerative employment in the silicate industries during their summer vacation will be excused from summer field work, providing they are so employed for one month, subject to the approval of the head of the department.

**Freshmen who show deficient preparation in English or Mathematics may be assigned by the Dean of the Junior College and the Dean of Engineering, to special classes, with one credit hour more work than indicated above, or in case of clear indication of failure, even with this arrangement, they may be assigned to Academic classes.

Total semester hours 18

Sophomore Year.

FIRST SEMESTER.

		Required semester hours
Mathematics 24,	Analytical Geometry	2
Mathematics 25,	Calculus	3
English 12,	Argumentation	2
Chemistry 43,	Qualitative Analysis	3
Physics 303,	Mechanics and Heat	5
Civil Engineering 345,	Surveying	2
Mechanical Engineering 322,	Mechanical Drawing	1
Mining Engineering 318,	Journal Club	
Military 3, or Athletics		
	Total semester hours	18
History 17,	The American People	1

To be taken in Sophomore or Junior year.

SECOND SEMESTER.

		Required semester hours
Mathematics 26,	Differential and Integral Calculus	4
Chemistry 46,	Elementary Quantitative Analysis	4
Physics 404,	Electricity and Magnetism and Light and Sound	5
Civil Engineering 446,	Surveying	2
Mechanical Engineering 401,	Analytical Mechanics	3
Mechanical Engineering 483,	Mechanical Drawing	1
Mining Engineering 419,	Journal Club	
Military 4, or Athletics		
Mining Engineering 423,	Summer Field Work	

Students who secure remunerative employment in the silicate industries during their summer vacation will be excused from summer field work, providing they are so employed for one month, subject to the approval of the head of the department.

	Total semester hours	19
History 18,	American Statesmen	1

To be taken in Sophomore or Junior year.

Junior Year.

FIRST SEMESTER.

		Required semester hours
Mechanical Engineering 502,	Analytical Mechanics	5
Ceramics 501,	Ceramic Chemistry	5
Geology 501,	General Geology	4
Mechanical Engineering 503,	Materials of Construction	3
Physics 523,	Physical Laboratory	1
Mining Engineering 506,	Seminar	
	Total semester hours	18

Optional:

History 7,	America in the Far East	2
English 7,	Debating	1
Civics 7,	Comparative Government	2
Literature 13,	Literature	2

SECOND SEMESTER.

		Required semester hours
Mechanical Engineering 686,	Analytical Mechanics	4
Ceramics 602,	Ceramics	5
Civil Engineering 656,	Structural Engineering	3
Mining Engineering 614,	Metallurgy	4
Mechanical Engineering 613,	Engineering Laboratory	1
Mining Engineering 607,	Seminar	
Mining Engineering 613,	Summer Field Work	

Junior students who secure instructive employment in one of the great clay working or cement manufacturing districts of the country will be excused from the Junior summer field work, providing they are so employed for at least six weeks subject to the approval of the head of the department.

Total semester hours	17

Optional:

History 9,	Far Eastern Question	2
English 8,	Debating	1
Civics 7,	Comparative Government	2
Literature 14,	Literature	2

Senior Year.

FIRST SEMESTER.

For students graduating in 1910 and later. For course of study of graduates of 1909 see Catalog for 1907-1908.

		Required semester hours
Ceramics 704,	Ceramics	5
Ceramics 703,	Ceramic Chemistry	5
Geology 704,	Geology	4
Mechanical Engineering 784,	Steam Engines and Boilers	2
Engineering 702,	Specifications and Contracts	1
Ceramics 705,	Ceramics	1
Mining Engineering 708,	Seminar	
	Total semester hours	18
Optional:		
History 7,	America in the Far East	2
Civics 7,	Comparative Government	2
Economic Science 12,	Engineering Economics	2
Literature 13,	Literature	2

SECOND SEMESTER.

For students graduating in 1910 and later. For course of study of graduates of 1909 see Catalog for 1907-1908.

		Required semester hours
Ceramics 806,	Ceramics	5
Mechanical Engineering 809,	Constructive Engineering	3
Geology 805,	Geology	4
Engineering 801,	History of Engineering	1
Ceramics 807,	Special and Thesis	5
Mining Engineering 809,	Seminar	
	Total semester hours	18
Optional:		
History 9,	The Far Eastern Question	2
Civics 7,	Comparative Government	2
Economic Science 12,	Engineering Economics	2
Literature 14,	Literature	2

Two Year Course in Clay Working

The short course in clay-working is designed to accommodate men already engaged in practice who may not have at their disposal sufficient time to take the four year course or who may not have had the opportunity to prepare themselves to meet the entrance requirements to the long course. It aims to equip such persons for advancement by presenting the essential principles of the various operations involved in the production of clay wares. The several subjects treated in this course are arranged in sequential order and as far as possible the principles discussed in the classroom are verified in the laboratory and the field. The preliminary studies of the first year are essential as a foundation for the understanding and prosecution of the more specialized work of the last two semesters. This course is planned to render the same sort of service to clay-workers as does the two year course in Mining Engineering to practical miners.

TWO YEAR COURSE IN CLAY WORKING.

First Year.

FIRST SEMESTER.

		Required semester hours
Mathematics 3,	Algebra	5
Mathematics 5,	Plane Geometry	5
Chemistry 21,	Elementary Experimental Chemistry	5
Mechanical Engineering 121,	Mechanical Drawing	2
Mechanical Engineering 130,	Shop Work	2
Mining Engineering 101,	Principles of Mining	
	Total semester hours	19

SECOND SEMESTER.

		Required semester hours
Mathematics 6,	Solid Geometry	2
Mathematics 30,	Plane Trigonometry	3
Chemistry 23,	Elementary Experimental Chemistry	5
Ceramics 602,	Ceramics	4
Civil Engineering 204,	Descriptive Geometry	2
Mechanical Engineering 331,	Shop Work	2
Mining Engineering 220,	Principles of Mining	
	Total semester hours	18

Second Year.

FIRST SEMESTER.

		Required semester hours
Ceramics 501,	Ceramic Chemistry	5
Ceramics 704,	Ceramics	5
Physics 303,	Mechanics and Heat	5
Mining Engineering 506,	Seminar	
	Total semester hours	15

SECOND SEMESTER.

		Required semester hours
Ceramics 703,	Ceramic Chemistry	5
Ceramics 806,	Ceramics	5
Geology 501,	General Geology	4
Civil Engineering 446,	Surveying	2
Mechanical Engineering 423,	Mechanical Drawing	2
Mining Engineering 607,	Seminar	
	Total semester hours	18

COURSES IN CERAMICS.

501. Ceramic Chemistry. Required first semester Junior year in Ceramics and first semester second year in Two Year course in Clay Working. Quantitative anaylsis of raw materials used in the clay and cement industries. Especial attention is given to silicate minerals, beginning with those of simpler composition and progressing as far as possible in the analysis of the more complex clays, feldspar, etc. Five hours credit. Recitations, two hours and three laboratories per week.

602. Ceramics. Required second semester Junior in Ceramics, and second semester first year in Two Year course in Clay Working. Classification, properties and methods of winning clays and other materials used in the ceramic industries. Laboratory work in clay testing accompanying. Five hours in course in Ceramics and four hours in course in Clay Working.

703. Ceramic Chemistry. Required first semester Senior in Ceramics and second semester second year in Two Year course in Clay Working. Course 501 continued. Rational analysis of clays and pottery bodies, chemical calculations. Five hours credit. Two recitations and three laboratories per week.

704. Ceramics. Required first semester Senior year in Ceramics and first semester second year in Two Year course in Clay Working. Manufacture of clay wares, including preparation of the clay, formation of the ware, drying and burning. Five lectures per week.

705. Ceramics. Required first semester Senior year in Ceramics Visits to important clay and cement working centers. Careful study and written reports on the plants inspected. One hour credit.

806. Ceramics. Required second semester Senior year in Ceramics and second semester second year in Two Year course in Clay Working. Manufacture and technique of glazes, enamels, cements, and cement products. Five hours credit. Three recitations and two laboratories per week.

807. Ceramics. Second semester Senior, course in Ceramics, quantitative analysis and compounding of bodies, glazes and cements. Special problems, some one of which shall be the basis for a thesis. Five hours credit. Two recitations and three laboratory periods per week.

ENGINEERING EXPERIMENT STATION

ENGINEERING EXPERIMENT STATION

Engineering Experiment Station Staff.

A. B. STORMS, A. M., D. D.,
President Ex-officio.

A. MARSTON, C. E.,
Director.
Civil Engineering.

S. W. BEYER, B. S., PH. D.,
Mining Engineering.

L. B. SPINNEY, B. M. E., M. S.,
Electrical Engineering.

W. H. MEEKER, M. E.,
Mechanical Engineering.

A. A. BENNETT, M. S.,
Chemist.

C. E. ELLIS, M. S. A.,
Assistant Chemist.

I. A. WILLIAMS, M. S., A. M.,
Assistant.

M. I. EVINGER, B. C. E.,
Assistant.

F. M. OKEY,
Assistant.

THE ENGINEERING EXPERIMENT STATION.

While the principal business of the several Engineering departments of the College is perhaps to give instruction to their students, the fact is recognized that the state contributes largely to the financial support of the College and that in return, not only should the College give tuition to the youth of Iowa, but it should contribute as much as possible to the successful carrying on of the industrial interests of the state. By the establishment of experiment stations the national government has recognized the duty of the land grant colleges to the agricultural interests. The Engineering departments of this College believe that it is their proper business to aid the other industrial enterprises of the state.

With this thought as the motive, the several Engineering departments have undertaken during the past twelve years and will continue in the uture to undertake to carry on investigations of interest and value to ıe industries of Iowa, as need therefor may arise, in so far as the unds available will permit. A number of pamphlets and bulletins giving he results of some of these investigations have already been published, nd have been received with much favor by the people of the state. By trong resolutions numerous industrial and public organizations in Iowa ıave expressed their approval of this work.

In recognition and furtherance of this work the 31st General Asembly has appropriated a specific annual sum for the establishment of ın Engineering Experiment Station, for carrying on and publishing ulletins of investigations of value to the industrial and municipal inerests of Iowa.

Work of the Engineering Experiment Station.

One of the most important lines of investigation already undertaken is sewage disposal. The first sewage disposal plant in Iowa was constructed at the College in 1898 and has been in highly successful operation ever since. The authorities of many cities in the state have visited it. The College is continually carrying on investigations in sewage disposal, both with the large plant and with smaller experimental plants. Among the special subjects now being investigated may be mentioned those of the disposal of creamery sewage, and small plants, built for less than $100 each, for disposing of the sewage of private houses.

In addition a representative of the Engineering Experiment Station each year visits all the sewage disposal plants of the state, making tests of the efficiency and securing the data of the operation of the plants. The results of these examinations and of other investigations are published in bulletin form for free distribution.

Another line of investigation has been tests of building materials, which have also been under way for several years. Thousands of such tests, of all kinds of building materials in Iowa, have been made and the results published for the benefit both of the manufacturers and the consumers of the state.

Investigations helpful to the clay interests of the state have been under way for some years, and additional equipment is being put in for this work. Opportunity is provided whereby anyone can send to the Experiment Station samples of clay, to be tested as to suitability for material for brick, tile or other clay wares.

During past years the Mining Engineering Section of the Station has been engaged in careful investigation of cement materials of the state. A very large number of samples of materials have been sent in from different parts of the state and have been carefully analyzed and studied as to their availability as cement materials. This work has been done in co-operation with the State Geological Survey.

The investigations of Iowa coals have been of much value to the manufacturers and to the mining interests of the state, as has been shown by the large demand for the bulletin already published. This work is being continued and largely extended.

It is planned to conduct a statistical inquiry of the power plants of the state, with personal examination of each plant and study its conditions. The results of this investigation will be helpful in suggesting improvements in methods and systems in Iowa power plants.

Careful tests of electric lamps have been made a special feature of the Engineering Experiment Station work. Any city or corporation can now send its lamps to the station (which has been made the official testing station of the Iowa Electrical Association) and have careful tests of efficiency, candle power and durability made at short notice and slight cost, and thus determine whether it is getting proper return for the money paid for its lamps. Many such lamps are being sent in, and in addition special investigations along this line are being conducted, the results of which will be published in bulletin form.

An investigation of the properties of Iowa limes as compared with those from other states has been completed, and a bulletin of the results published.

The above is only a part of the work done or planned by the Engineering Experiment Station.

TESTS OF MATERIALS.

More and more the cities and other public bodies of the state, together with private corporations, are sending in samples of various materials to be tested in the laboratories of the Engineering Experiment Station.

Many places are having their cements tested to see whether they are up to specifications.

The same is true of brick, both for paving and building purposes.

Steel, iron, stone, wood and other materials of construction can be sent in for tests to advantage.

Users of cement are sending samples of their sands for tests, to select the best.

Many samples of clay are received for analysis, test, and report as to value.

Ores are received for assaying work.

Coal can be sent in for test of its calorific value for fuel, and the absence of deleterious elements.

Electric lamps are being sent in by many cities and corporations for test to decide whether they are up to the representations on which they were bought.

All such testing work for the people of Iowa is done at bare cost. We invite further work of this kind, and promise our best efforts to be of assistance to all residents of the state along these and similar lines.

LIST OF ENGINEERING EXPERIMENT STATION BULLETINS.

Bulletin No. 1.—The Iowa State College Sewage Disposal Plant and Investigations. (Now out of print.) This bulletin describes the college plant, the first in the state, and gives the results of the first year of operation, including bacterial and chemical analysis. 21 pgs., 6 cuts.

Bulletin No .2.—Bacteriological Investigations of the Iowa State College Sewage. Results from Sept. 1, 1899, to Sept. 1, 1900. 22 pgs.

Bulletin No. 3.—Data of Iowa Sewage and Sewage Disposal. This bulletin gives a number of gaugings and analyses of Iowa sewage from different towns, and of various kinds, together with the detailed results of the operation of the college sewage disposal plant from May, 1900, to May, 1901. 27 pgs., 5 cuts.

Bulletin No. 4.—Bacteriological Investigations of the Iowa State College Sewage Disposal Plant. Results from 1898 to 1902. 19 pgs. 3 plates.

Bulletin No. 6.—Tests of Iowa Common Brick. This bulletin gives the results of several hundred tests of seven different varieties of common brick manufactured in Iowa. Crushing, transverse breaking, absorption and freezing and thawing tests are given in each case. 23 pgs., 28 cuts.

Bulletin No. 7.—Sewage Disposal in Iowa. This bulletin gives detailed descriptions, usually with plans, of all sewage disposal plants in Iowa up to December, 1903, with the history of sewage disposal in the state, and full details of the operation of the several plants, including chemical and bacterial tests of efficiency. This paper was awarded the Fuertes Medal by Cornell University, June, 1904, and the Chanute Medal of the Western Society of Engineers for 1903.

Bulletin No. 8.—This bulletin gives the results of several hundred tests of seven varieties of dry press brick commonly used in Iowa. Crushing, transverse breaking, absorption and freezing and thawing tests are given in each case. 19 pgs., 8 cuts.

Bulletin No. 9.—Notes on Steam Generation with Iowa Coal This bulletin gives a summary of a number of analyses of Iowa coal and tests of their heating power together with a discussion of the special difficulties encountered in burning Iowa coals and the best methods of overcoming these difficulties. 16 pgs., 3 cuts.

Bulletin No. 10.—Dredging by the Hydraulic Method, by George W. Catt, President of the Atlantic, Gulf and Pacific Dredging Co.

Bulletin No. 11.—An Investigation of Some Iowa Sewage Disposal Systems, by L. H. Pammel and J. B. Weems.

At this point the form of the bulletin was changed to a periodical published six times a year and the system of numbering the issues was changed accordingly.

Volume II, No. 6.—The Good Roads Problem in Iowa. This was the first bulletin published by the Iowa State Highway Commission and it gives a general discussion of the good roads problem in Iowa with instructions for building concrete culverts and for making King road drags.

Volume III, No. 1.—Tests of Cement. This bulletin gives a general discussion of the properties of cement, together with the results of several hundred tests made in the laboratory of the Engineering Experiment Station. Standard specifications for cement are also given.

Volume III, No. 2.—State Railroad Taxation. This is a discussion by Professor F. C. French, Associate Professor of Railway Engineering at the Iowa State College, on the different methods which are employed in taxing railways.

Volume III, No. 3.—Steam Generation With Iowa Coals. This bulletin reports the results of a number of investigations on mechanical stokers with Iowa coals, together with a summary of the results of the government tests on Iowa coals, hand fired. By Professors G. W. Bissell and W. H. Meeker.

Volume III, No. 4.—Incandescent Lamp Testing. This bulletin gives a comparison of the various kinds of incandescent lamps which are on the market, with respect to their initial candle powers and efficiencies and a determination of the ratio between the mean spherical and horizontal candle powers.

Volume III, No. 5.—Steam Pipe Covering Tests, with a special object of determining the value of steam pipe coverings of varying thicknesses, based upon the results of these tests and compiled by Professor Wilson.

Volume III, No. 6.—Assessments of Drainage Districts. This bulletin gives a detailed discussion by an experienced drainage engineer of proper method in accordance with Iowa law, assessing cost of drainage improvements upon the property owners of the district in proportion to the benefits. The bulletin is by Professor L. E. Ashbaugh.

Volume IV, No. 1.—Tests of Iowa Limes.

Volume IV, No. 2.—Asphalt Paving in Iowa.

Volume IV, No. 3.—Sewage Disposal in 1904-7.

Any of the above bulletins can be obtained by writing A. Marston, Director, Ames, Iowa.

IOWA STATE HIGHWAY COMMISSION.

A. MARSTON.
C. F. CURTISS.
Directors.

THOS. H. MACDONALD,
Highway Engineer.

J. B. DAVIDSON,
Engineer of Road Machinery.

Establishment of the Commission.

By act of the 30th General Assembly the College was constituted the State Highway Commission of Iowa and a small appropriation was made for road investigation and experimentation. It was made the duty of the Commission to obtain data from the counties and townships relating to road conditions; to furnish expert assistance to the several counties when called upon by the proper county officials; to prepare standard plans and specifications for road and bridge work, and to conduct each year a school of instruction for road workers at the College.

The 31st General Assembly increased the appropriation for the work and placed it on an annual basis.

Work of the Commission.

Since July, 1904, the Commission has been actively engaged in carrying out the provisions of the law as outlined above. A large amount of general and detailed information has been collected in various ways. In the 1905 census a supplementary card called the Agricultural Road Schedule was added and in this way complete detailed figures secured of the amount of traffic over the country roads from each farm. The results from several counties which have been worked up so far give promise of amazing totals for the entire state.

A number of tests of both stone and gravel for road material have been made in the Road Materials Laboratory and these tests will be continued to cover all the principal deposits in the state. Such material when sent in by road officials is tested free of charge. There has been a considerable demand for both the standard cross sections of roads and the plans of concrete bridges which have been developed by the Commission. No attempt, however, is made to make certain standard structures fit all places and whenever it is necessary a personal visit is made to the county and plans made after all information available has been secured.

Quite a representative line of machinery has been placed at the College by the companies manufacturing the different kinds. Short stretches of experimental gravel and stone roads have been constructed.

School of Instruction for Road Officers.

The first school for road officers was held in June, 1905, and the second in August, 1906 and the third in September, 1907. This year the school will probably be held in September. Regular instruction is given in road grading, culvert and bridge building, road laws, and such subjects as are of pertinent interest to road men generally. Each county and township board is urged to pay the expenses of at least one representative as it is felt the experience gained and the new ideas acquired will prove of much value in the local work.

Bulletins Published.

Such material as was of value has been incorporated in the various publications of the Commission.

"The Good Roads Problem in Iowa" took up the subject from a broad general standpoint. It points out the general ways in which the road money is handled and the saving that could be effected with some system applied to this work. This bulletin was issued before much detailed information was available.

"The Manual for Highway Officers" is a 102-page booklet, containing a digest of the road laws; information in regard to the general topographic features as they affect road building; ways and methods of road building and maintenances and plans and instructions for the use of concrete in culverts and bridges.

"The Annual Report of the Iowa Highway Commission, 1904-5." A pamphlet of 75 pages giving a detailed report of the operations of the Commission with an itemized statement of expenditures. The subjects for legislation were also discussed.

"1906 Revision, Manual for Highway Officers." The Manual was revised entirely in 1906 and much new material added. The new material added is chiefly along the lines of road construction and the use of concrete.

"1907 Report." The second annual report. The general subjects are the same as for the first report.

All of these publications can be obtained by writing to the Commission.

The aim of the Highway Commission is to build up an engineering and advisory bureau to furnish practical aid to the counties and at the same time to carry on experiments and demonstrations of educational and scientific value. So far the work has been developing very encouragingly.

DIVISION OF SCIENCE AS RELATED TO THE INDUSTRIES

DIVISION OF SCIENCE AS RELATED TO THE INDUSTRIES

Many of the courses of study taught in this Division form a very essential part of those belonging to the other Divisions, so that the work required for the various degrees conferred by the College authorities is very thoroughly interwoven.

The object of the work in this Division is very comprehensively expressed in the act of Congress establishing this and similar colleges. The founding of these colleges on a basis of scientific learning has proved to be the beginning of an important epoch in educational history. The courses of study in this Division are less technical than are many of those of the other Divisions. The real advances in modern civilization have been along the lines of science study and investigations. It is the intent therefore to lay a broad foundation in scientific facts and principles in order to fit the graduate to fill his place in the affairs of the world. There can be no better preparation for the duties of life and for citizenship than the knowledge and mental training given by a genuine study of the sciences.

During the first two years the lines of study are well marked out and but little choice of subjects is given. The required mathematics end with the Freshman year. The subject may be pursued, however, during the remainder of the course, provided the student desires and is qualified to do so.

The various branches of the study of the English language extending throughout the Freshman and Sophomore years are sufficient in scope and purpose to give the needed training in the use of English. The modern languages, namely, French, German and Spanish are great storehouses of the sciences, and consequently courses of study in these languages are offered to the student in the earlier years of his work to enable him to use these languages in the last two years of his study. The study of the sciences is strongly supported by work in literary, historical and psychological lines.

The course in General Science leads to the degree of Bachelor of Science (B. S.).

The course in Domestic Economy leads to the degree of Bachelor of Science in Domestic Economy (B. S. in D. E.).

COURSE IN GENERAL SCIENCE.

Academic Year.

Any student who at entrance presents satisfactory credit for part of the Academic course, or who by examination passes part of it satisfactorily will be classified in such of the remaining work offered in the Academic year as the Dean of the Junior College and the Dean of the Science Division shall consider will best prepare him for his college course. After providing in such classification for the remainder of the thirty credits required for entrance to college, the student may complete his schedule by taking up some of the Freshman studies.

FIRST SEMESTER.

				Required semester hours
	Mathematics 3,	Algebra		5
	English 2,	Rhetoric and Composition		5
	Modern Languages			
	The Language selected must be carried through the entire year.			
Choice	Language 1,	French	5	5
	Language 5,	German	5	
	Language 30,	Spanish	5	
	Civics 8,	Government in State and Nation		3
		Total semester hours		18

SECOND SEMESTER.

	Mathematics 5,	Plane Geometry		5
	Literature 9,	English Classics		5
	Modern Languages			
	The Language selected must be a continuation of the one chosen at the beginning of the Academic year.			
Choice	Language 2,	French	5	5
	Language 6,	German	5	
	Language 31,	Spanish	5	
	History 2,	Advanced American		4
		Total semester hours		19

**Freshman Year.

FIRST SEMESTER.

Required semester hours

Science

Students who take Botany or Zoology in the Freshman year will be required to take Chemistry 2, or Physics 301 or 303, in the Sophomore year. Students who take Chemistry

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**Freshmen who show deficient preparation in English or Mathematics may be assigned by the Dean of the Junior College and the Dean of Science, to special classes, with one credit hour more work than indicated above, or in case of clear indication of failure, even with this arrangement, they may be assigned to Academic classes.

in the Freshman year will be required to take Botany 27, or Zoology 2, in the Sophomore year.

The science chosen must be continued through the entire Freshman year.

Choice	Botany 27,	General Botany	5	5
	Chemistry 2,	General Chemistry	5	
	Zoology 2,	General Zoology	5	
	Mathematics 4,	College Algebra		5
	English 10,	Narration and Description		3
	Modern Languages			

The Language selected must be carried through the entire year.

Choice	Language 3,	French	5	5
	Language 7,	German	5	
	Language 32,	Spanish	5	

Fully accredited students who have presented for admission four credits in Latin will take Modern Language 1, 5 or 30.

Military 1, (for men)	Military Drill	
Physical Culture 1, (for women)	Marching Tactics	
Library 1,	Library work (four hours per semester)	
	Total semester hours	18

SECOND SEMESTER.

Required semester hours

Science

The science selected must be a continuation of the one chosen at the beginning of the Freshman year.

Choice	Botany 28,	General Botany	5	5
	Chemistry 5,	Qualitative Analysis	5	
	Zoology 3,	General Zoology	5	
	Mathematics 6,	Solid Geometry		2
	Mathematics 30,	Plane Trigonometry		3
	English 11,	Exposition		3
	Modern Languages			

The Language selected must be a continuation of the one chosen at the beginning of the Freshman year.

Choice	Language 50,	French	3	3
	Language 26,	German	3	
	Language 38,	Spanish	3	

Those who took Language 1, 5 or 30 in first semester Freshman will continue with Language 54, 29, or 42.

History 5,	Europe in the XVIth, XVIIth, and XVIIIth Centuries	3
Military 2, (for men)	Military Drill	
Physical Culture 2, (for women)	Calisthenics	
	Total semester hours	19

Sophomore Year.

FIRST SEMESTER.

				Required semester hours
English 12,		Argumentation	2	2
*Botany	27,	General Botany	5	16 to 18
	24,	Plant Embryogeny 1	5	
	30,	Bacteriology 4		
	4,	Cryptogamic Botany	5	
*Chemistry	2,	General Chemistry	5	
	11,	Quantitative Analysis	5	
*Mathematics 8,		Plane Analytical Geometry	5	
*Physics	301,	Mechanics and Heat	3	
	303,	Mechanics and Heat	5	
*Zoology	2,	General Zoology	5	
	5,	Embryology	5	
History 6,		French Revolution and XIXth Century	3	
Modern Languages				
The student may continue the Language taken in the Freshman year.				
Language 51,		French	3	
Language 27,		German	3	
Language 39,		Spanish	3	
Those who took Language 54, 29 or 42 in second semester Freshman will take Language 55, 71, or 43.				
Public Speaking 2,		The Declamation	1	
Domestic Economy 1, (for women)		Clothing	2	
Military 3, or Athletics (For Men)				
Physical Culture 3, (for women)		Light Apparatus		
		Total semester hours		18 to 20

Rules for the selection of studies in this semester.

1. Students who take Botany or Zoology in the Freshman year will be required to take Chemistry 2, or Physics 301 or 303, in the Sophomore year. Students who

take Chemistry in the Freshman year will be required to take Botany 27, or Zoology 2, in the Sophomore year.

2. Not less than 8 hours of the starred (*) subjects must be selected.

3. Not more than 5 hours can be taken in any department.

4. Any beginning science chosen must be carried through the year.

SECOND SEMESTER.

Any beginning science of the first semester Sophomore year must be continued through this semester.

				Required semester hours
*Botany	28,	General Botany	5	18 to 20
	12,	Vegetable Cytology	5	
	15,	Systematic Phanerogams	5	
*Chemistry	5,	Qualitative Analysis	5	
	9,	Organic Chemistry	5	
*Mathematics 9,		Differential and Integral Calculus	5	
*Physics	402,	Electricity and Magnetism and Light and Sound	3	
	404,	Electricity and Magnetism and Light and Sound	5	
*Zoology	3,	General Zoology	5	
	7,	Comparative Anatomy	5	
	14,	Advanced Invertebrate Zoology	5	
Civics 6,		Actual Government	3	
Literature 2,		Epic and Lyric Poetry	5	
The student may continue the Language taken in the first semester Sophomore.				
Modern Languages				
Language 52,		French	3	
Language 28,		German	3	
Language 40,		Spanish	3	
Those who took Language 55, 71, or 43 in the first semester Sophomore will take Language 56, 72 or 44.				
Domestic Economy, 4, (for women)		Clothing	2	
Military 4, or Athletics (For Men)				
Physical Culture 4, (for women)		Swedish Gymnastics		
		Total semester hours		18 to 20

Junior Year.

Either at the beginning of the Junior year or not later than the end of the first emester of that year candidates for the degree of Bachelor of Science in the General Science course must select a science which shall constitute a major line of study hroughout the Junior and Senior years. This work shall occupy not less than three ours per week during any one semester. The total number of hours of the major subject, however, shall not be less than sixteen hours during the two years. In addiion to the work in the chosen line of study, or the major subject, the student may be equired to choose at the proper time during the two years from five to ten hours of ourses that are requisite to the proper development of this work. The line of study with the additional study requisite to it are to be decided upon after consultation with he Dean of Science and the Head of the Deparment in which the line of work is aken. The major science shall be chosen from among the following named sciences: Botany, Zoology, Physics, Economic Science, Mathematics, Geology and Chemistry. The remainder of the total sixty-four to eighty hours required shall be selected from mong all the courses offered on consultation with the Dean of Science and the Heads f the Departments in which the work may be selected and is otherwise unrestricted. Not later than the beginning of the second semester of the Junior year these courses hall be made out on blanks furnished at the Dean's office and a copy left on file here. These outlines of study shall consist of the special line of study and the subects requisite to it and enough other subjects to make ten to fifteen hours work. The emainder may be filled in at the beginning of each semester. The outline as placed n file cannot be changed without the special permission of the faculty.

FIRST SEMESTER.

		Required semester hours
(Elective)		
Enough work will be selected from the list of electives given on page 231 to make a total of from sixteen to twenty hours per week		16 to 20
	Total	16 to 20

SECOND SEMESTER.

		Required semester hours
Public Speaking 8,	Orations and Orators	1
(Elective)		
Enough work will be selected from the list of electives given on page 231 to make a total of from sixteen to twenty hours per week		15 to 19
	Total	16 to 20

Senior Year.

		Required semester hours
(Required)		
Public Speaking 10,	Extempore Speech 2	1 or 2
Public Speaking 9,	Oration 1	
(Elective)		
Enough work will be selected from the list of electives given on page 231 to make a total of from sixteen to twenty hours per week		15 to 18
	Total	16 to 20

SECOND SEMESTER.

	Required semester hours
(Elective)	
From sixteen to twenty hours per week will be selected from the list of electives given on page 231.	Total 16 to 20

COURSE IN DOMESTIC ECONOMY.

(For Women Only)

Academic Year.

Any student who at entrance presents satisfactory credit for part of the Academic course, or who by examination passes part of it satisfactorily will be classified in such of the remaining work offered in the Academic year as the Dean of the Junior College and the Dean of the Science Division shall consider will best prepare her for her college course. After providing in such classification for the remainder of the thirty credits required for entrance to college, the student may complete her schedule by taking up some of the Freshman studies.

FIRST SEMESTER.

				Required semester hours
Mathematics 3,		Algebra		5
English 2,		Rhetoric and Composition		5
Modern Languages				
The Language selected must be carried through the entire year.				
Choice	Language 1,	French	5	5
	Language 5,	German	5	
	Language 30,	Spanish	5	
Civics 8,		Government in State and Nation		3
		Total semester hours		18

SECOND SEMESTER.

				Required semester hours
Mathematics 5,		Plane Geometry		5
Literature 9,		English Classics		5
Modern Languages				
The Language selected must be a continuation of the one chosen at the beginning of the Academic year.				
Choice	Language 2,	French	5	5
	Language 6,	German	5	
	Language 31,	Spanish	5	
History 2,		Advanced American		4
		Total semester hours		19

Freshman Year.

FIRST SEMESTER.

		Required semester hours	
Domestic Economy 1,	Clothing	2	
Mathematics 4,	College Algebra	5	
Botany 29,	General Botany	5	
English 10,	Narration and Description	3	
Physical Culture 1,	Marching Tactics		
Elective: To be selected from the Junior College studies in the list of Science Electives on page 231.		3 or	5
	Total hours required	18	20

SECOND SEMESTER.

		Required semester hours	
Domestic Economy 4,	Clothing	2	
Mathematics 6,	Solid Geometry	2	
Mathematics 30,	Plane Trigonometry	3	
Chemistry 22,	Elementary Chemistry	5	
English 11,	Exposition	3	
Physical Culture 2,	Calisthenics		
Elective: To be selected from the Junior College studies in the list of Science Electives on page 231.		3 or	5
	Total hours required	18	20

Sophomore Year.

FIRST SEMESTER.

		Required semester hours	
Domestic Economy 6,	Costume	2	
Chemistry 24,	Elementary Applied Chemistry	5	
Physics 301,	Mechanics and Heat	3	
Zoology 2,	General Zoology	5	
Physical Culture 3,	Light Apparatus		
Elective: To be selected from the Junior College Studies in the list of Science Electives on page 231.		3 or	5
	Total hours required	18	20

**Freshmen who show deficient preparation in English or Mathematics may be assigned by the Dean of the Junior College and the Dean of Science, to special classes, with one credit hour more work than indicated above, or in case of clear indication of failure, even with this arrangement, they may be assigned to Academic classes.

SECOND SEMESTER.

		Required semester hours
Domestic Economy 7,	Costume	2
Chemistry 9,	Organic Chemistry	5
Physics 402,	Electricity and Magnetism and Light and Sound	3
Zoology 3,	General Zoology	5
Physical Culture 4,	Swedish Gymnastics	
Elective: To be selected from the Junior College Studies in the list of Science Electives on page 231.		3 or 5
	Total hours required	18 20

Junior Year.

FIRST SEMESTER.

		Required semester hours
Chemistry 11,	Quantitative Analysis	5
Zoology 12,	Human Physiology	5
Botany 38,	Bacteriology	2
Horticulture 11,	Floriculture	2
Enough work will be selected from the list of electives on page 231 to make		2 or 6
	Total hours required	16 to 20

SECOND SEMESTER.

		Required semester hours
Zoology 13,	Human Physiology	5
Domestic Economy 35,	Food and Dietetics	5
Domestic Economy 37,	Home Sanitation	2
Botany 35,	Fermentations	2
Enough work will be selected from the list of electives on page 231 to make		2 or 6
	Total hours required	16 to 20

Senior Year.

FIRST SEMESTER.

		Required semester hours
Domestic Economy 8,	Laundry Work	1
Domestic Economy 27,	Household Accounts	1
Domestic Economy 36,	Food and Dietetics	5
Public Speaking 15,	D. E. Extempore Speech	2

Electives:			
Domestic Economy 9,	Theory of Teaching Domestic Science	2	7 to 11
Domestic Economy 11,	History of Art	2	
Domestic Economy 14,	Theory of Teaching Domestic Art	2	
For additional Electives, see page 231.			
	Total hours required		16 to 20

SECOND SEMESTER.

		Required semester hours	
Domestic Economy 13,	Home Decoration	1	
Domestic Economy 22,	Home Nursing	1	
Domestic Economy 23,	Home Management	1	
Domestic Economy 38,	Geography of Foods	2	
Electives:			
Domestic Economy 10,	Theory and Practice of Teaching Domestic Science 2		11 to 15
Domestic Economy 12,	History of Art 2		
Domestic Economy 30,	Seminar 1		
Domestic Economy 32,	Theory and Practice of Teaching Domestic Art 2		
For additional Electives, see page 231.			
	Total hours required	16	to 20

Classification for students in Domestic Economy Course for year, 1908-09.

All students classified straight Freshman Domestic Economy or General and Domestic Science in year 1907-08 may classify Sophomore in new Domestic Economy Course, taking Chemistry 22 in place of Chemistry 24.

All regular classified Sophomore Domestic Economy or General and Domestic Science in year 1907-08 may classify Junior in Domestic Economy Course taking the following work:

Junior Year.

FIRST SEMESTER.

		Required semester hours
Botany 38,	Bacteriology	3
Chemistry 24,	Chemistry	5
Zoology 2,	General Zoology	5
Horticulture 11,	Floriculture	2
Domestic Economy 8,	Laundry Work	1
Domestic Economy 27,	Household Accounts	1
	Total hours required	17

SECOND SEMESTER.

		Required semester hours
Botany 35,	Fermentations	2
Chemistry 9,	Chemistry	5
Zoology 3,	General Zoology	5
Domestic Economy 35,	Food and Dietetics	5
Domestic Economy 37,	Home Sanitation	2
	Total hours required	19

Senior Year.

FIRST SEMESTER.

		Required semester hours
Chemistry 11,	Chemistry	5
Zoology 12,	Human Physiology	5
Domestic Economy 36,	Food and Dietetics	5
Public Speaking 15,	D. E. Extempore Speech	2
	Total hours required	17

SECOND SEMESTER.

		Required semester hours
Zoology 13,	Human Physiology	5
Domestic Economy 13,	Home Decoration	1
Domestic Economy 22,	Home Nursing	1
Domestic Economy 23,	Home Management	1
Domestic Economy 38,	Geography of Foods	2
Enough work will be selected from the list of electives page 231 to make		6 to 10
	Total hours required	16 to 20

All regularly classified Junior Domestic Economy students in year 1907-08 may complete the new Domestic Economy Course by taking the following work:

Senior Year.

FIRST SEMESTER.

		Required semester hours
Chemistry 11,	Chemistry	5
Zoology 12,	Human Physiology	5
Public Speaking 15,	D. E. Extempore Speech	2
Domestic Economy 36,	Food and Dietetics	5
	Total required hours	17

SECOND SEMESTER.

		Required semester hours
Zoology 13,	Human Physiology	5
Domestic Economy 13,	Home Decoration	1
Domestic Economy 22,	Home Nursing	1
Domestic Economy 23,	Home Management	1
Domestic Economy 8,	Laundry Work	1
Domestic Economy 27,	Household Accounts	1
Enough work will be selected from the list of electives on page 231 to make		6 to 10
	Total hours required	16 to 20

Subjects which may be elected in the Junior or Senior years in the General Science, and Domestic Economy Courses, subject to the conditions governing admission to each course.

Note—(The number in the parenthesis indicates the number of hours credit).

FIRST SEMESTER.

Subjects which count as Science.

Botany, 4 (5), 5 (3 or 5), 6 (3), 10 (2), 13 (2), 14 (2), 17 (3), 18 (1), 19 (2), 22 (2), 27 (5), 34 (4), 37 (3).
Chemistry, 2 (5), 11 (5), 14 (5).
Domestic Economy, 8 (1), 36 (5).
Economic Science, 1 (5), 3 (3), 7 (2), 9 (3).
Geology, 501 (5), 704 (4).
Mathematics, 7 (2), 8 (5), 10 (2), 11 (3), 15 (2), 24 (2), 25 (3).
Psychology, 1 (5).
Physics, 509 (2), 514 (2), 523 (1), 516 (2).
Zoology, 2 (5), 4 (4), 5 (3 to 5), 10 (3 to 5), 11 (3 to 5), 12 (5), 17 (3).

General Subjects.

Civics, 2 (3), 6 (2), 9 (3).
Civil Engineering, 308 (4).
Domestic Economy, 1 (2), 6 (2), 11 (2).
English, 7 (1), 12 (2).
History, 3 (3), 10 (2), 12 (2), 20 (2).
Horticulture, 8 (3), 11 (2).
Language, 1 (5), 3 (5), 5 (5), 7 (5), 22 (5), 24 (5), 30 (5), 32 (5), 34 (5).
Literature, 1 (3), 4 (3), 5 (5), 6 (2), 8 (2).
Military, 5 (1), 7 (1).
Psychology, 4 (3).
Public Speaking, 2 (1), 3 (2), 5 (2), 7 (2), 10 (2).
Veterinary, 33 (2).

SECOND SEMESTER.

Subjects which count as Science.

Botany, 11 (4), 12 (4), 15 (3 or 5), 18 (1), 20 (3), 28 (5), 30 (4), 35 (2), 36 (4).
Chemistry, 9 (5), 16 (2), 31 (4), 32 (4), 36 (5), 47 (5).
Domestic Economy, 22 (1), 33 (1), 35 (5), 37 (2), 38 (2).
Dairy, 10 (1).
Economic Science, 4 (2), 5 (3), 6 (2), 9 (3), 11 (2), 13 (1).
Geology, 2 (5), 6 (4), 9 (2), 607 (4), 805 (4).
Mathematics, 9 (5), 16 (4), 18 (1), 23 (3), 26 (4).
Physics, 615 (1), 617 (2).
Psychology, 3 (3).
Zoology, 3 (5), 6 (1), 7 (5), 8 (2), 10 (3 to 5), 13 (5), 14 (3), 18 (2).

General Subjects.

Civics, 3 (3), 4 (2).
Domestic Economy, 4 (2), 7 (2), 12 (2), 13 (1).
English, 8 (1), 12 (2).
History, 4 (3), 9 (2), 11 (2), 20 (2).
Language, 2 (5), 6 (5), 23 (3), 25 (3), 26 (3), 31 (5), 35 (3), 38 (3), 50 (3).
Literature, 2 (5), 3 (3), 7 (2), 10 (3), 11 (2).
Military, 6 (1), 8 (1).
Psychology, 2 (3), 4 (3).
Public Speaking, 4 (2), 6 (2), 8 (1), 11 (2).

DEPARTMENT OF MATHEMATICS.

EDGAR WILLIAMS STANTON, PROFESSOR.
MISS MARIA ROBERTS, ASSOCIATE PROFESSOR.
MR. PATTENGILL AND MISS COLPITTS, ASSISTANT PROFESSORS.
MISS FLEMING, MR. JONES, MISS SMITH AND MISS ANDERSON, INSTRUCTORS.

The work of the Department of Mathematics is directed to the following ends:

(1) The Development of Intellectual Strength.—Such a degree of thoroughness is required as awakens interest and stimulates to earnest effort. The work is so arranged as to compel the student to abandon the mere mechanical methods of reaching results. He can make little or no progress except through the mastery of principles and methods; and in their application there is demanded of him a high degree of ingenuity, care and courage. He is subjected to the continuous discipline of holding details in mind, comparing facts, drawing conclusions and advancing to the discovery of new truth. He learns to think, judge, originate, and through his mathematical training gains mental strength.

(2) Accuracy in Presentation of Mathematical Truths. — The student is required not only to think clearly, but to put his thought into concise and precise English. In the explanation of examples he is asked to bring out and emphasize the principles involved, dealing in detail with such equations only as are necessary to this purpose. In the solution of problems an analysis of statement and equation must be given, definitions and theorems must be stated clearly and accurately and in the demonstration of propositions the use of correct language is considered as secondary only to the employment of correct logic.

(3) The acquirement of such Command of the Subject Matter of Mathematics as will make it a Valuable Instrument in Higher Scientific and Technical Study.—To this end an effort is made to eradicate from the student's mind the idea entertained by many, that mathematical truths are learned simply to be forgotten, and to awaken in its place an earnest desire to obtain a comprehensive and abiding knowledge of the essential facts of the science. Thoroughness in daily recitation is demanded, frequent reviews are given and final credits are made to depend largely upon the student's grasp of principles and the readiness and the accuracy with which he performs the simple and the complex operations involved in their application. Each branch as it is taken up is so presented as to require the constant employment of the principles and facts of the preceding mathematical studies. The Department aims in this way to give the student such a degree of mathematical maturity and self-reliant mastery as will enable him to use his mathematical knowledge with profit either in advanced collegiate work or as an instructor in our high schools and academies.

COURSES IN MATHEMATICS.

1. **Algebra to Involution.** Required for entrance to all Academic courses unless satisfactory credits are presented. Students taking up this work must have a thorough knowledge of addition, subtraction, multiplication, division, factoring, highest common factor, lowest common multiple, fractions, and simple equations containing one or more unknown quantities. Preparation in excess of this will be to the student's advantage. The review and advanced work of this course includes an exhaustive study of those subjects which in any standard text precede involution, the examples and problems being more difficult than those in the ordinary text book. Special stress is laid upon the statement of definitions and the demonstration of principles. Recitations, five hours per week.

2. **Algebra, Involution to Ratio and Proportion.** Required first semester Academic year in all courses of those students who have completed course 1 at the College. Includes study of Involution of Monomials and Polynomials; Evolution, including the consideration of the higher roots of polynomials, and rules for determining the roots of numbers based upon the algebraic method of extracting roots; Radicals, including

the fundamental operations, involution, evolution, rationalization, imaginary quantities, extracting the square root of binomial surds and the solution of equations involving radicals; Pure and Affected Quadratics; Equations solved like quadratics; and Simultaneous Quadratic Equations. Prerequisite, course 1. At the completion of this course students are expected to have such grasp of algebra through quadratics as will enable them to handle its principles up to this point without error and perform the operations required with rapidity and accuracy. Recitations, five hours per week.

3. **Algebra Review.** Required first or second semester, academic year in all four year courses and first semester of the first year in Two Year courses in Ceramics and Mining Engineering. This course, which covers all fundamental principles up to and including radicals and quadratics, takes the place of the *review in arithmetic* given in most high schools and corresponds to the *review in algebra* given in an increasing number of the best high schools of the state.

The object aimed at is not only a thorough review of the elements of algebra, but a wider grasp of principles and their application in more difficult fields. Many examples assigned are such as enter into future work. The student is thus introduced to a quality of work demanding a broad view of principles and methods, and a marked degree of skill in algebraic manipulation.

The course is intended primarily for students, who having taken elementary algebra in the high school, need a thorough review before entering advanced work, but it may be taken by students who show evidence of a thorough knowledge of algebra through simple equations and at least a brief course through radicals.

Admission is secured by examination or upon the certificate of the proper officer of a high school.

Recitations, five hours per week.

4. **College Algebra.** Required first semester Freshman year in Science courses. Includes study of ratio, proportion, variation, the progressions, permutations, binomial theorem, convergency and divergency of series, theorem of undetermined coefficients including partial fractions, principles and use of logarithms, and the theory of equations. Prerequisites, Courses 1 and 2 or Course 3. Also open to graduates of fully accredited high schools. The first ten days of the semester is devoted to a review of algebra up to and including quadratics. Students failing in this test will be assigned to such work as they are fitted to pursue.

Graduates of accredited schools are earnestly urged to carefully review their work in algebra before entering this course. The sample questions printed elsewhere in this catalogue give a good idea of the knowledge of the subject needed. The Department will gladly unite with the student and his school principal in arranging to test the thoroughness of his home review; such test can be given in connection with the work of the high school and if satisfactory to the Department, will be accepted in lieu of the review test at the College. The student can then begin his advanced work without delay. Students designing to take the review here must be present promptly at the opening of the semester. Correspondence regarding this whole matter is cordially invited.

Students not graduates of the fully accredited schools will be admitted to this course upon passing a satisfactory examination upon the work covered by Course 3. Arrangements can be made with the principals of high schools or county superintendents to conduct such examinations. The principal of any school desiring to test the ability of his students to enter upon the work of this course will be furnished, upon request, a list of examination questions. The Department will be pleased to mark the examination papers and enter upon its records as accredited students in the Mathematical Department the names of all students who show that they are prepared to take up the work with success. Recitations, five hours per week.

5. Plane Geometry. Required second semester Academic in all four year courses, and first semester of first year in two year courses in Ceramics and Mining Engineering. Includes subjects generally treated in a standard text, including fundamental definitions and axioms, theorems relating to rectilinear figures and the circle, measurement of angles; doctrine of limits; theory of proportion; similar polygons; comparison and measurement of the surfaces of rectilinear figures; measurement of the circle, and geometrical construction of plane figures. Text book, Phillips and Fisher. The proofs outlined must be fully amplified; definitions must be stated with precision; authority cited must be given in full and the logical steps in demonsration must be so arranged and presented as to constitute a complete and rigid proof. The student must understand each proposition and be able to state the demonstration in concise geometric language. Special emphasis will be laid upon the demonstration of original exercises. Prerequisite, Course 1. Recitations, five hours per week.

6. Solid and Spherical Geometry. Required second semester Academic year in Engineering courses and second semester Freshman year in all Science courses. Looking forward to this work the students immediately before leaving home should carefully go over the whole subject of plane geometry. The subjects considered in the course are the properties of planes, of diedral and polyedral angles, of prisms, of pyramids and other polyedrons, of cylinders, cones and spheres, of spherical triangles and spherical polygons. Prerequisites, Courses 3 and 5. Two hours credit. Recitations, five hours per week the last six weeks of the semester, in Engineering courses, first six weeks in all other courses.

7. Spherical Trigonometry. Elective first semester Junior or Senior year in all Science courses. The spherical right triangle is investigated; triangles of reference are formed and formulas deduced therefrom; Napier's rules are applied; the six different cases arising in the solution of right triangles are discussed and illustrated by numerous examples. Spherical triangles in general are considered; the formulas relating thereto are derived and applied to the solution of examples; interesting problems connected with the celestial spheres are included in the course. Prerequisites, Courses 21 and 22 or 30. Two hours credit. Recitations, four hours per week first half of the semester.

8. Plane Analytic Geometry. Elective first semester Sophomore, Junior or Senior year in Science and Junior or Senior year in all Agricultural courses. The subject is taught largely from the standpoint of its value as a disciplinary study. Once the student is impressed with the spirit of its method, the beauty of its logic and the excellent field for analytical reasoning it opens up, he will readily find a way to a mastery of the particular facts it reveals. The student is introduced to the subject through a review of the special algebraic, trigonometric and geometric conceptions upon which it is based. These are applied to the analytic representation of points in a plane and the proposition established that all geometric lines and curves can be represented by equations, and their properties and relations discovered by a study of these equations. The line, the circle and the conic sections are in this way most carefully investigated. Examples involving principles are solved and from a knowledge of particular the student is led to the demonstration of general theorems. The generalized truth is then employed in the development of other truth, and thus the student is given a most excellent drill in both inductive and deductive reasoning. At the same time his needs, as a scientific student, of a knowledge of the facts of analytic geometry are fully met. Text book, Analytic Geometry by Tanner and Allen of Cornell University. Prerequisites, Courses 4 and 30. Recitations, five hours per week.

9. Differential and Integral Calculus. Elective second semester Sophomore, Junior or Senior year in Science courses, Junior or Senior year in all Agricultural courses. All preceding mathematical work should be completed before this course is undertaken. Calculus bears to that work the double relation that, while it is based upon it and cannot be pursued successfully except as the work has been well mastered, it on the other hand furnishes a most excellent opportunity for a general review of the preceding mathematical studies and gives to all that has gone before a significance and value which it would otherwise lack. It is therefore a most important part of any extended and thorough mathematical course. The abstruse principles of this higher method of mathematical investigation are explained upon the theory of limits. The theory of infinitesimals is also employed. In differential calculus the rules of differentiations, expansion of functions, indeterminate forms, tangents, normals and asymptotes, direction of curvature, points of inflection, radius of curvature, order of contact, the osculating circle, envelopes, singular points and maxima and minima of functions are studied. In integral calculus much time is spent in acquiring a usable knowledge of the forms of integration. Application of integration is then made to the determination of the lengths of plane curves, areas of plane surfaces and surfaces of revolution, volumes of solids of revolution and other solids. Recitations, five hours per week with a review of week's work each Friday.

10. Differential Equations. Required first semester Junior year in Electrical Engineering, elective first semester Junior or Senior in Science courses. Supplementary to integral calculus, including the formation of differential equations; solution of equations of the first order with applications to geometry, mechanics and physics. Prerequisite, Course 9 or 26. Recitations, two hours per week.

11. Advanced Differential Equations. Elective first semester Junior or Senior year in Science courses. Includes all subjects of Course 10 and in addition the study of the methods of handling linear equations with constant and variable coefficients; exact differential equations; integration in series; equations of the second order with geometrical, mechanical and physical applications; ordinary differential equations with more than two variables; partial differential equations of the different orders. Prerequisite, Course 9 or 26. Recitations, three hours per week.

15. Advanced Analytic Geometry. Elective first semester Junior or Senior year in Science courses. A study of the general equation of the second degree, higher plane curves and analytic geometry of three dimensions. Prerequisites, Courses 8 and 9. Two hours credit. Recitations, four hours per week during last half of the semester.

16. Advanced Calculus. Elective second semester Junior or Senior year in Science courses. Deals with the application of differential calculus to the discussion of the properties of curves; the application of both differential and integral calculus to functions of a complex variable; and the subject of definite integrals and the use of double integration in measuring surfaces. The principles involved are illustrated by numerous examples. Prerequisites, Courses 8 and 9. Recitations, four hours per week.

17. Algebra and Trigonometry. Required first semester Freshman year in all agricultural courses.

The main object of this course is to so ground the student in the principles of trigonometry as to enable him to carry successfully his work in surveying, drainage and allied subjects. The course is intended to give the student sufficient knowledge of the subject to enable him to elect analytic geometry and calculus which are fundamental to certain lines of work in the agronomy course. The subjects investigated are definitions; positive and negative angles; circular measures of angles; operations upon angles; functions of angles, their relations and varying values; determination of values of the functions of particular angles; functions of different angles expressed in terms of those of a basal angle; derivation and reduction of trigonometric formulas; solution of right and oblique triangles. The points most strongly emphasized are: Care in tracing the trigonometric functions of varying angles in the different quadrants, readiness and skill in the derivation and reduction of trigonometric formulas and accuracy in the use of logarithmic tables. Prerequisites, Courses 3 and 5. Three hours credit.

18. Mathematical Analysis. Elective second semester Junior or Senior year in Science courses. Consists of lectures on the principles involved in the previous Mathematical courses. Its main purpose is to emphasize those principles which are most important and to suggest methods of presenting them effectively in the class room, thus helping those who expect to teach in mathematical lines. Prerequisites, all previous courses. One lecture per week.

20. College Algebra. Required first semester Freshman year in all four year courses in Engineering and Ceramics. Includes study of ratio, proportion, variation, permutations, the progressions, binomial theorem, convergency and divergency of series, theory of undetermined coefficients including partial fractions, principles and use of logarithms, and theory of equations. Prerequisites, same as for Course 4. Recitations, five hours per week during first twelve weeks of the semester.

21. Plane Trigonometry. Required first semester Freshman year in all four year courses in Engineering and Ceramics. Includes study of definitions; positive and negative angles; circular measure of angles, functions of angles, their relation and varying values; determination of functions of different angles expressed in terms of those of a basal angle; solution of trigonometric equations and the proving of identities. Prerequisites, Courses 3, 5, 6 and 20. Recitations, five hours per week during last four weeks of the semester.

22. Plane Trigonometry. Required second semester Freshman year in all four year courses in Engineering and Ceramics. Includes those subejcts of the usual courses in trigonometry not included in Course 21; namely, the derivation of the formulae relating to the sum and difference of two angles, functions of double angles and of half angles with identities and equations based upon these formulae and the solution of right and oblique triangles. Prerequisites, Courses 20 and 21. Recitations, five hours per week during first seven weeks of the semester.

23. Plane Analytic Geometry. Required second semester Freshman year in all four year courses in Engineering and Ceramics, elective Junior or Senior year in all courses in Science and in Agriculture. The work covered is the first eight chapters in Tanner and Allen's Analytic Geometry. Prerequisites, Courses 20, 21 and 22. Three hours credit. Recitations, five hours per week during last twelve weeks of the semester.

24. Plane Analytic Geometry. Required first semester Sophomore year in all four year courses in Engineering and Ceramics, elective Junior or Senior in all courses in Science and Agriculture. The work covered is chapters IX, X, XI in Tanner and Allen's Analytic Geometry. This course, together with Course 23 which precedes it, covers the same ground as Course 8. Prerequisite, Course 23. Two hours credit. Recitations, five hours per week during first four weeks of semester.

25. Calculus. Required first semester Sophomore year in all four year courses in Engineering and Ceramics, elective Junior or Senior year in all Science and Agricultural courses. The work covers the rules of differentiation, together with numerous examples illustrating their use and a large number of problems showing the close relation of differential calculus to physics and mechanics, also its application to the expansion of functions and to indeterminate forms. In Integral Calculus, the rules of integration are derived and enforced by a sufficient number of examples to make this most efficient tool of the engineer thoroughly ready for his later use. Prerequisites, Courses 20, 21, 22, 23, 24. Three hours credit. Recitations, five hours per week last twelve weeks of semester.

26. **Calculus.** Required second semester Sophomore in all four year courses in Engineering and Ceramics, elective Junior or Senior year in all courses in Science and in Agriculture. The work covered in differential calculus includes tangents, normals, asymptotes, direction of curvature, points of inflection, radius of curvature, order of contact, osculating circle, envelopes, singular points, and maxima and minima; in integral calculus, applications are made to obtaining lengths of plane curves, areas of plane surfaces, and surfaces of revolution, volumes of solids of revolution and other solids. Prerequisite, Course 25. Recitations, four hours per week.

27. **Spherical Trigonometry.** Required first semester Junior year in Civil Engineering course. Covers same ground as Course 7. One and a half hours credit. Recitations, four times a week for seven weeks.

30. **Plane Trigonometry.** Required second semester Freshman year in Science courses and second semester of first year in Two Year courses in Ceramics and Mining Engineering. The subjects covered are the same as those included in Course 17, with the exception that since the students taking this course have had considerable previous work in logarithms, more time is devoted to identities and the solution of trigonometric equations. Prerequisites, Courses 3, 4, 5 and 6. Three hours credit.

DEPARTMENT OF GENERAL AND APPLIED CHEMISTRY.

ALFRED A. BENNETT, PROFESSOR.
LOLA A. PLACEWAY, ASSOCIATE PROFESSOR.
W. F. COOVER, ASSOCIATE PROFESSOR.
LOLA STEPHENS, LAURA TAGGART AND MELISSA FLYNN, INSTRUCTORS.
LILLIAN LISTER, R. W. GETCHELL AND I. WERSHOW, LABORATORY ASSISTANTS.

The aim of the instruction in Chemistry is to develop in the student the inductive and experimental method of study, to excite in him an appreciation and love for true experimentation and to train his powers for inductive thinking, thus laying a foundation for technical or applied Chemistry.

The method of study is, therefore, distinctively the laboratory method. On the average, the student employs two hours of time in laboratory study for every hour of recitation. This proportion of time for the two divisions of work is especially carried out in the earlier part of the class study. The class room work aids to fix in the mind of the student chemical principles and facts based upon what has been learned by the actual handling and study of chemical substances.

Equipment and Accomodations.

The Chemical department occupies the whole of the four floors of the building known as Chemical Hall. The building is "T" shaped with a front 70 feet by 40 feet and a wing of 60 feet by 32 feet and contains twenty-seven rooms, ten of which are laboratories, the remainder being lecture, office, balance and store rooms.

The laboratories contain working tables which by a system of lockers can accommodate six hundred students. The assaying laboratory is well supplied with tables, furnaces and other apparatus for fire assaying. The laboratory for the course in blow piping is fitted with air blast and all of the usual conveniences for such laboratories.

The department is well supplied with accurate weights and balances for the courses involving quantitative analysis.

Persons desiring to prepare themselves to become teachers of chemistry, analytical chemists, or those seeking a preparation for the study of medicine will find here good facilities for study. The expenses are only sufficient to cover the actual cost of the material used in the prosecution of the work.

Description of Courses in Chemistry.

The work in Chemistry is conveniently grouped under the following general heads: (a) General and Descriptive Chemistry; (b) Analytical Chemistry, Qualitative and Quantitative Analysis; (c) Organic Chemistry; (d) Studies in Applied Chemistry.

(a) **General and Descriptive Chemistry** includes an elementary study of the non-metallic and metallic elements, their history, occurrence, preparation, properties and their principal compounds. In order better to train his powers of observation the student is required to describe the apparatus used and the phenomena produced, and to trace the relation of the results obtained to laws and principles.

The different courses in General and Descriptive Chemistry are arranged to meet, as far as practicable, the special needs of the students of the various departments. However, it is recognized that at this stage of the work the **Science of Chemistry** is the student's most practical acquisition.

(b) **Analytical Chemistry,** both **Qualitative** and **Quantitative,** is taken up in an elementary way at first and may be followed by courses in more advanced work. After this preliminary knowledge is obtained, the direction of the work will depend to a great extent on the degree the student is aiming to obtain. For the degree in **Agriculture** the analytical study is directed to an examination of those substances of agricultural interest, and to prepare the student for an intelligent use of the scientific data upon which agriculture is founded. In any case the purpose is to study Applied Chemistry from the standpoint of its fundamental principles.

In the recitations, methods of analysis are described and discussed, and the study of the theoretical chemistry carried forward. In this work, courses of study are arranged for graduate as well as for undergraduate students.

(c) In **Organic Chemistry,** courses are offered for the first degree and also as major and minor subjects for graduate students.

The course required of the students in the Division of Veterinary Science is of an elementary nature and is intended to give a sufficient knowledge of the subject to lay the foundation for the study of Physiological Chemistry which follows. The latter course considers the chemical changes going on in the living animal body; the essential composition of foods and the changes through which they pass in the animal economy; the chemistry of the secretion and excretion. The laboratory study is devoted to the three principal food constituents and to urine analysis.

The undergraduate in the division of Agriculture under the topic Organic Chemistry, studies in addition to the general principles of the subject, the chief food substances, i. e., the carbo-hydrates, fats, and proteids, poisonous substances found in the organic world, such as the alkaloids, ptomaines; the chemistry of milk and of the manufacture of butter and cheese. In a word, the student will consider, as completely as the time allotted to the subject will allow, the important questions that concern agriculture from the chemical standpoint.

To undergraduate students in the Division of Science is given a fairly complete outline of the theory of the structure and formation of organic compounds, but special attention is given to those compounds that are of commercial importance. In the laboratory the student prepares many of the more important manufactured organic substances, such as alcohol and soaps, and makes a special study of vinegars, sugar, petroleum and its products, glycerine, etc.

With this work as a foundation the graduate student selects some feature or features for more complete study. The amount and character of the work is left for arrangement between the individual and the head of the department. However, this will embrace such work as the analysis and study of foods, oils, fats, and the methods of preparation, purification, and adulteration of commercial organic substances.

(d) **Applied Chemistry.** It is recognized among persons whose opinions are worthy of consideration that the application of any science to the problems of life can be profitably taken up by the student only after a thorough grounding in the principles upon which the science rests. The purpose of the preliminary courses in this subject is to give this training as completely as possible.

Some twenty-five courses of study in applied chemistry are offered, or are required of the students for the various degrees open to them.

In the nature of the case, this work is essentially quantitative analysis and consists of courses in the analysis of Agricultural products; Fue and Gas Analysis; Blowpipe Analysis; Assaying; Chemistry of the Household; The Preparation of Organic and Inorganic Compounds.

The courses in Agricultural Analysis include both inorganic and organic substances; such as: Soils, fertilizers, water, fodders and dairy products. This work is open to undergraduate and graduate students i. e., the latter class of students will carry forward the work begun in the usual college courses.

The course in Fuel and Gas Analysis consists of the study of solid liquid and gaseous fuels, in reference to their composition, and to their relative economic values. The student may devote the time of this course, principally, to technical analysis. The principles and methods of quantitative analysis learned in the elementary courses will be applied in the advanced work to the analysis of various organic and inorganic substances, such as foods, iron and steel. The application of the facts of Electro-chemistry to the quantitative analysis of ores, and in the manufacture of chemicals will be studied in an elementary manner. Although the work is largely done in the laboratory, it will be supplemented by lectures and recitations.

Quantitative Analysis by "fire methods," or as it is commonly called, Assaying, is applied to gold, silver, copper and lead ores.

The courses in chemical preparations will include the formation of pure and commercial articles from raw materials, and the common adulteration of these products.

Chemistry of the Household considers the elementary chemistry of the principal food materials, changes produced in them during cooking and digestion, of cleaning and of adulteration of the chief food substances.

This course may be accompanied by a laboratory study of soaps, soap preparations, sugars, syrups, vinegars, and baking powders.

The work in Physiological Chemistry for the student in the Science Division (Course 36) includes a careful study in the laboratory, of the composition of foods, the chemical characteristic of their constituents, the changes during digestion and assimilation, and the products of metabolism. The classroom work correlates these facts and by lectures and text-book they are given their appropriate explanation.

The work in Water Analysis covers a study of the methods employed, namely the so-called mineral and sanitary analysis, and the interpretation of these results, especially from the standpoint of the household, and for use in boilers in the production of steam. Methods of purification of water and a study of sewage will receive attention.

In each course in Chemistry, except course 10, a deposit of $5.00 is charged to cover cost of materials used and breakage.

COURSES IN CHEMISTRY.

1. **Elementary Inorganic Chemistry.** Required first semester Freshman Year in Veterinary Course. Three hours credit. Recitations, two hours and laboratory, three hours per week.

2. **General Chemistry.** Elective first semester Freshman, Sophomore, Junior or Senior in General Science Course. Five hours credit. Recitations, three hours and laboratory, six hours per week.

4. **General Chemistry (Metals).** Required second semester Freshman year in Veterinary Course. Three hours credit. Recitations, two hours and laboratory, six hours per week.

5. **Qualitative Analysis.** Elective second semester Freshman, Sophomore, Junior or Senior year in the General Science course. Continuation of Course 2. Five hours credit. Recitations, three hours and laboratory, six hours per week.

9. **Organic Chemistry.** Required second semester Sophomore year in Domestic Economy, elective second semester Sophomore, Junior or Senior year in General Science course. Prerequisites, Courses 2 and 5 or 22 and 24. Five hours credit. Recitations, four hours and laboratory, three hours per week.

10. **Elementary Organic Chemistry.** Required first semester Sophomore year in Veterinary Course. Lectures, two hours per week.

11. **Quantitative Analysis.** Required first semester Junior year in Domestic Economy, elective first semester Sophomore, Junior or Senior year in General Science Course. Prerequisites, Courses 2 and 5 or 22 and 24. Five hours credit. Recitations, two hours and laboratory, nine hours per week.

13. **Physiological Chemistry.** Required second semester Sophomore year in Veterinary course. Recitations, two hours and laboratory, one period per week.

14. **Organic Chemistry.** Elective first semester Junior or Senior year in Science courses. Continuation of Course 9, subject to arrangement by head of department and pupil. Five hours credit. A major or minor graduate study.

16. **Chemistry of the Household.** Elective second semester Junior or Senior year in Science courses. Prerequisites, Courses 2, 5, and 9, or 22, 24, and 9. Credit, two hours. One lecture and one laboratory per week.

22. **Elementary Chemistry.** Required second semester Freshman year in Domestic Economy Course. Five hours credit. Recitations, three hours and laboratory, two periods per week.

24. **Elementary Applied Chemistry.** Required first semester Sophomore year in Domestic Economy Course. Five hours credit. Recitations, three hours and laboratory, two periods per week.

30. **Quantitative Analysis.** Required first semester Senior year in Mining Engineering Course. Continuation of Course 12. Two hours credit.

31. **Inorganic Preparations.** Elective second semester Junior o Senior year in Science courses. Prerequisites, Courses 2, 5, and 9 c 22, 24 and 9. Four hours credit. Recitations, two hours and laborator two periods per week.

32. **Quantitative Analysis.** Elective second semester Junior o Senior year in all Science courses. Continuation of Course 11. Fo hours credit.

36. **Physiological Chemistry.** Elective second semester Senio year in all Science courses. Prerequisites, Courses 2, 5, and 9 or 22, 2 and 9. Five hours credit. Recitations, three hours and laboratory, tw periods per week.

39. **Water and Sewage Analysis.** Elective second semeste Senior year in Civil Engineering Course. Recitation, one hour and laboratory, two periods per week.

41. **General Chemistry.** Required first semester Freshman yea in all Engineering courses. Recitations, two hours and laboratory, on period per week.

42. **General Chemistry.** Required second semester Freshma year in all Engineering courses except Civil Engineering. Continuatio of Course 41. Recitations, two hours and laboratory, one period per week

43. **Qualitative Analysis.** Required first semester Sophomor year in Mechanical, Mining and Electrical Engineering Courses. Continuation of Course 42. Three hours credit. Recitations, one hour an laboratory two hours per week.

44. **Study of the Metals.** Required second semester Sophomor year in Civil Engineering Course. One hour credit.

45. **Analytical Chemistry.** Required second semester Sophomor year in Mechanical and Electrical Engineering courses. Two hour credit.

46. **Elementary Quantitative Analysis.** Required second semester Sophomore year in Mining Engineering Course. Four hours credi

47. **The Chemistry of Foods and Food Adulteration.** Electiv second semester Junior or Senior year for all Science students. Prerequisites, Courses 2 and 5 or 22 and 24 and 9 and 11. Five hours credi Three recitations or lectures and two laboratory periods.

48. **Assaying.** Required in the first semester of the Junior yea in the Mining Engineering Course. Prerequisites 41, 42 and 43. Fou hours credit. Recitations and laboratory study.

49. **Study of Metals.** Required in second semester of the Freshman year in the Civil Engineering Course. Four hours credit.

Graduate Work in Chemistry.

Graduate students will be provided with work in Organic an Inorganic Chemistry extending through two years if desired.

This subject is open as a major study to graduates of this an other colleges of equal standing who have pursued the study of chem istry for two years and who are by this prepared to carry on independent work in the various directions that may be arranged by them and the ead of the department. The courses of study will be along the lines f Applied or Industrial Chemistry with a sufficient ground work of theoretical study to give a rational explanation and conception of the processes involved. The work will include advanced analytical and synthetical chemistry, i. e., a study of the methods of chemical analysis nd the preparation of organic and inorganic compounds of industrial nd commercial importance. The graduate student will select work along some one of these general lines of study and will devote his time to this, supporting it by other necessary collateral study, and such research in the literature of the subject as the library facilities will permit. A good reading knowledge of the German language will be essential to good progress in the prosecution of the work. Minor subjects in this department will be arranged so as to help as much as is possible the major subjects selected in the other departments.

Major or minor work may be taken in any of the following courses:

15. **Analysis of Foods.** Prerequisites, Courses 2, 5, 9 and 11.
17. **Fuel and Gas Analysis.** Prerequisites, Courses 2, 5, 9 and 11.
18. **Electro-Chemistry.** Prerequisites, Courses 2, 5 and 11.
19. **Water Analysis.** Prerequisites, Course 11.
33. **Qualitative Analysis.**
35. **Organic Preparations.** Prerequisite, Course 9.

AGRICULTURAL CHEMISTRY.

A. A. BENNETT, PROFESSOR.
W. F. COOVER, ASSOCIATE PROFESSOR.

The aim of the work in Agricultural Chemistry is twofold; namely, to give the student a fundamental knowledge of chemistry, and then to apply this knowledge to the chemical problems of agriculture.

Throughout the courses in Agricultural Chemistry, the study of chemical principles and relations is accompanied by its application to agricultural questions.

Courses in Agricultural Chemistry.

21. **Elementary Experimental Chemistry.** Required first semester Sophomore year in all Agricultural courses and first semester of first year in Two year courses in Ceramics and Mining Engineering. Introductory work intended to give knowledge of matter by actual handling and experience with it. Includes study of so-called non-metallic elements present in air and soil. The recitations review the work of the laboratory, the student learning how to take useful notes, their interpretation and application to common chemical changes occurring in nature. Five hours credit. Recitations, three hours and laboratory, two periods per week.

23. Elementary Experimental Chemistry. Required second semester Sophomore year in all Agricultural courses and second semester of first year in Two year courses in Ceramics and Mining Engineering. Continuation of Course 21. A study of the metallic or basic elements, their relation to non-metallic elements or the acids, and their place in formation of salts; the separation and recognition of these elements and their compounds preparatory to determining them quantitatively. Five hours credit. Recitations, three hours and laboratory two periods per week.

25. Agricultural Analysis. Required first semester Junior year in all Agricultural courses. A study of the fundamental principles of organic chemistry; the proximate composition of the various grain, root and fodder crops; the composition and changes occurring in farmyard and other manures; and the chemistry of assimilation and digestion. The laboratory work includes the preparation and study of a limited number of organic compounds, and study of carbohydrates, fats and proteids. Prerequisite, Course 23. Four hours credit. Recitations, three hours and laboratory one period per week.

26. Agricultural Analysis. Required second semester Junior in Dairying and Animal Husbandry and elective in Junior or Senior in all other Agricultural courses. Includes preliminary work involving the principles of gravimetric and volumetric analysis, followed by analysis of fertilizers, grain and mill feeds and fodders. Prerequisite, Course 25. Four hours credit. Recitations, two hours and laboratory two periods per week.

27. Agricultural Analysis. Elective first semester Junior or Senior year in all Agricultural courses. Continuation of Course 26. Includes analysis of feeds, dairy products, vegetables, fruits, fresh foods, alcoholic beverages, vinegars, and other materials, frequently analyzed, such as limestones and waters for boiler supply. Outline for work, Sherman's "Notes on Organic Analysis" supplemented by lectures. Four hours credit. Recitations, two hours and laboratory two periods per week.

28. Dairy Chemistry. Required first semester of One Year Course in Dairying. An elementary course arranged to fit the needs of the students in this course. Two lectures with accompanying experimental study. Two hours credit.

29. Dairy Chemistry. Required second semester, One Year Dairy Course. Two lectures with accompanying experimental study. Two hours credit.

34. Advanced Agricultural Analysis. Elective second semester Junior or Senior year in all Agricultural courses. For those who wish to specialize in agricultural analysis. Involves the use of polariscope on sugar and saccharine products, of bulyro-refractometer in analysis of fats and oils, or calorimeter in the determination of fuel value of food-stuffs and fuels. Laboratory work may be along some special line or along any of the following subjects: the analysis of sugar and saccharine products, oils, fats and waxes, soaps and lubricants, paints and varnishes, tea, coffee and cocoa, canned fruits and vegetables, relishes, extracts and spices. Text-book, Sherman's "Notes on Organic Analysis," supplemented by notes. Prerequisite, Course 27 or 40. Four hours credit. Recitation, one hour and laboratory three periods per week.

40. Dairy Chemistry. Elective first semester Junior or Senior year in all Agricultural courses. Analysis of pure dairy products; also a qualitative and quantitative analysis of adulterated products; the detection of the preservatives and coloring matters commonly used. Reference book, Richmond's "Dairy Chemistry." Prerequisite, Course 26. Four hours credit. Recitations, two hours and laboratory two periods per week.

Graduate Work in Agricultural Chemistry.

Advanced work in Agricultural Chemistry leading to the Master's degree in Scientific Agriculture may be selected either as a major or minor study. This work may be taken in the Chemical department as a continuation of the work begun as an undergraduate of this or any other college of equal rank, or the student may elect to do this work with the chemical section of the Experiment Station, thus coming in touch with the research work and investigations being carried on there.

Graduate work may be taken in any of the following lines:

(a) **Chemistry of Soils.** Includes a study of Soil Chemistry and its relation to plant life, including the chemical composition, relation to fertility, determination of available plant food, fertilizers and other substances effective in production of crops, rain and drainage waters, and loss of plant food due to improper drainage and other conditions.

(b) **Chemistry of Dairying.** Covers a general survey of field of chemistry, applied to dairy problems, as the composition and chemical changes of butter, milk and cheese, and other fats and oils used as foods or as adulterants.

(c) **Chemistry of Feeds.** Includes study of the chemistry of plants and field crops, as chemical composition of corn, wheat and oats, methods of modifying and improving the chemical composition by selection and plant breeding, chemical study of growing plants during the various stages of development, effects of various elements in the soil on the composition, quality, yield or development of grain and forage crops, also study of the chemical composition and nutriments of the various refuse and by-products used for stock feeding.

(d) **Chemistry of Horticulture.** Includes study of chemical composition of fruits, including the influence of various elements in soil on the composition, quality, and productiveness of the orchard, vineyard or garden, also influence of climatic conditions, selection and breeding upon the composition and quality of fruits.

DEPARTMENT OF BOTANY AND GENERAL BACTERIOLOGY.

LOUIS HERMANN PAMMEL, PROFESSOR.
ROBERT EARLE BUCHANAN, ASSISTANT PROFESSOR OF GENERAL BACTERIOLOGY
ESTELLE D. FOGEL, INSTRUCTOR IN BOTANY.
HARRIETTE KELLOGG, CURATOR OF THE HERBARIUM.
ADA HAYDEN, ROYAL JEFFS, HARRY F. WATT AND WINFIELD SCOTT DUDGEON
LABORATORY ASSISTANTS.

The Department of Botany and General Bacteriology occupies th major portion of the third and several rooms on the fourth floor o the new Central Building. Twenty-five well lighted and equipped room are devoted to the work of this department.

The Laboratory for Elementary Students, accommodating thirt students each period, is well equipped with individual laboratory table lockers, dissection microscopes, water, gas, reagents, etc.

Laboratory for Histology and Pathological Botany, accommodatin thirty students each period, is equipped with separate laboratory table individual compound microscopes, lockers, wall cases, water and gas, an an abundance of fresh and preserved material for study.

The Laboratory in Cytology, accomodating eight students, is equippe with heavy laboratory tables supplied with water, gas, Leitz triple objective microscopes, paraffine baths, microtomes, stains, reagents, an abundant facilities for all kinds of cytological investigations.

The Laboratory for Physiological Botany is equipped with the necessary apparatus for a systematic study of the functions and activities o plants and their parts. Will accomodate eight students.

Laboratory for Special Botanical Drawing is primarily intended fo students writing theses in this department and for post-graduates.

The Laboratory for Economic Botany is equipped with dissectin and compound microscopes and with an excellent economic herbarium.

The General Bacteriological Laboratory, accommodating twenty students, the Bacteriological Laboratory for advanced students, accommodating eighteen students, and the Research Room in Bacteriology ar each well equipped with large glass topped tables for each student, fitte up with gas, tap and distilled water, lockers for culture media and variou apparatus, wall lockers for incubation of cultures at room temperatur thermostats, ice chests, a culture room, balances, hood, and compoun Leitz microscopes especially designed for bacteriological work.

The Media Room is fitted with stone topped tables, water, ga etc., for the preparation of the various media used in the laborator A long hood covers the sterilizers and autoclaves needed for the preparation of these media.

For the use of all students in Bacteriology there is a small roo for keeping cavies, etc., for experimentation, and also special facilitie in the plant laboratories for experimental inoculation of plants.

A well lighted room on the fourth floor, used as pathological and ysiological greenhouse laboratory, supplies an abundance of fresh ma- rial for class and laboratory work.

The lecture room is equipped with a very complete outfit for lantern emonstrations, both slides and lantern views.

HERBARIUM. The department now has about ninety thousand ounted and catalogued specimens in the herbarium. These consist f 44,000 in the General Phanerogamic Collection, 25,000 in the Parry ollection, 5,000 in the General Cryptogamic Collection, 15,000 in the ryptogamic Exsiccati, and 1,200 in the Seed Collection. These speci- ens were collected in the Mississippi Valley, in Iowa in particular, lso in the Eastern States, the Rocky Mountains, the Pacific coast and Europe. The collection of Phanerogams was commenced under Dr. essey and continued under Dr. Halsted. Beside this there is the arry Collection, Cryptogamic Herbarium, the Holway Herbarium (ex- epting the Uredineae), the Fink Herbarium (excepting the Lichens), nd the Andrews Collection.

Grass Collection. This collection contains excellent material rom every part of the state and various parts of the United States and urope. It is invaluable to the student in Agrostology.

Parry Collection. This collection contains hundreds of new spe- ies found by Dr. Parry on his collecting trips and is especially rich n the plants of California, Mexico and the Rocky Mountain Region. Most of these were collected before the advent of the railroad, many re types and hence invaluable.

Dendrological Collection. The herbarium also contains a very ex- ellent collection for dendrological study, many of the trees being represented by photographs and wood specimens. The cases in which the erbarium is placed are made of about fifty species of wood native to he United States.

Economic Collection. This collection consists of very complete sets of the various plants of economic importance, either as the friends or foes of man, including a collection of weeds and poisonous plants.

Seed Collection. This contains the sets of seeds distributed by the U. S. Department of Agriculture, several sets of German weed seeds, and a large collection of the seeds of various cultivated and wild plants. This collection is of the greatest value in the study of seed adulteration.

Cryptogamic Collection. This collection contains a large number of very valuable exsiccati, the Ravenel Fungi Americana, Ellis North American Fungi, the von Thuemen Mycotheca Universalis, those of Sydow, Krueger, Seymour and Earle and numerous smaller collections.

THE MUSEUM. The department has a large amount of material incorporated into an Economic Museum. The collections are systematically grouped, showing in many cases the evolution of the finished product from the crude material, especially of the fiber products. There is also a collection of the various edible and poisonous fungi in formalin.

The work of this department is divided into the courses in Botany and those in General Bacteriology, in each of which undergraduate and graduate courses are offered. For graduate work, the department offers unusual facilities, major or minor work being offered to supplement that of the various scientific courses.

COURSES IN BOTANY.

1. **Elementary Botany.** Required first semester Academic year in Agricultural courses. Embraces a study of the terms used in descriptive botany, and of morphology and determination of flowering plants Laboratory includes the chief points of elementary botany such as the germination of seed, the different members of the plant, the root, shoo and lateral appendages, the leaves, flower, fruit and seed. A collection of fifty named plants is required. Required of all students in these courses who have not had a high school laboratory course equivalent to three hours per week for twenty weeks. Two hours credit. One lecture and laboratory three hours per week. Fee, $1.50.

4. **Cryptogamic Botany.** Elective first semester Sophomore Junior or Senior year in all Science courses, and first semester Junior or Senior year in all Agricultural courses. A study of typical representatives of important groups below the flowering plants, especially smuts rusts, mildews, and moulds because of their significance in Agriculture Frequent excursions are obligatory. A collection of seventy-five mounted and classified specimens is required. Prerequisite, Course 27. Five hour credit. Lectures, three hours and laboratory six hours per week. Fee $3.00.

5. **Vegetable Pathology.** Required first semester Senior year in Horticulture and Science and Agriculture, elective first semeste Junior or Senior year in all other Agricultural and Science courses Study of the plant diseases of the various horticultural, garden and farm crops from the standpoint of the host plant; also theories of prevention of disease, of rotation of crops, and the use of fungicides. Prerequisite, Course 4. Three or five hours credit. Lectures, two hour and laboratory three or nine hours per week. Fee, $3.00.

6. **Advanced Non-vascular Cryptogams.** Elective first semester Junior or Senior year in all Science and Agricultural courses. Lecture and laboratory work on the various non-vascular cryptogams, particularly the fungi of our native flora; also laboratory investigation of a single group from both pathological and systematic point of view. Prerequisite Course 4. Three hours credit. Lecture, one hour and laboratory six hours per week. Fee, $3.00.

9. **Structural Botany.** Required first semester Freshman year in Veterinary Course. This course is designed for Veterinary students it being necessary that the well equipped Veterinarian have a knowledge of the terms used in morphological botany, and of the microscopic structure of plants. Vegetable drugs may consist of the whole plan

it more frequently of parts only, and hence the detection of adul- rants is a subject for microscopic determination. Thus this course cludes a study of parts of the plan from the root to the reproduc- re organs; with laboratory study of the histology of plants especially om the standpoint of pharmacognosy, with a brief survey of more nportant groups from a systematic standpoint. Three hours credit. ectures, two hours and laboratory three hours per week. Fee, $3.00.

10. **Economic Botany.** Elective first semester Junior or Senior ear in all Agricultural and Science courses. A microscopic study of rious plants and their food products and adulterants; the reserve od of plants, its form and use, and a systematic study by groups of e plants of economic value and a study of their origin and place of ltivation. Prerequisite, Course 1. Two hours credit. Lecture, one our and laboratory three hours per week. Fee, $2.00.

11. **Vegetable Physiology.** Required second semester Junior ear in Horticulture, Agronomy and Science and Agriculture, elective cond semester Junior or Senior year in Science and in all other Agri- ltural courses. Lectures and laboratory practices on the functions, rowth, nutrition, irritability, movements and reproduction of plants. rerequisite, Course 1. Four hours credit. Lectures, two hours and lab- ratory three hours per week. Fee, $3.00.

12. **Vegetable Cytology.** Elective second semester Sophomore, unior or Senior year in all Science courses and elective in Junior or enior year in all Agricultural courses. A study of the plant cell and s activities, use of various reagents in staining, imbedding, mounting; arious cell-like phenomena as they aid in an intelligent understanding f various problems in heredity and as illustrating DeVrie's Theory of Iutations and the relation in general of the hybrid and the cross to he parent. Prerequisite, Course 1 or 27. Four hours credit. Lectures, wo hours and laboratory six hours per week. Fee, $3.00.

13. **Agrostology.** Elective first semester Junior or Senior year n all Agricultural and Science courses. A systematic study of the otanical position and economic uses of important grasses, as those used n meadows and pastures, cereal food products, grasses in medicine, as oil binders and for lawn making. Two hours credit. Lecture, one our and laboratory three hours per week. Fee, $2.00.

14. **Seeds and Seed Testing.** Elective first semester Junior or Senior year in Science courses. Study of principal agricultural seeds nd weeds, methods of detection of weeds in commercial seeds, and tructure and germinative energy of various seeds. Prerequisite, Course . Two hours credit. Lecture one hour and laboratory three hours per veek. Fee, $2.50.

15. **Systematic Phanerogams.** Required second semester Sophomore year in Science and Agriculture and second semester Junior Horticulture, elective second semester Sophomore, Junior or Senior year in ll Science courses and elective in second semester Junior or Senior year n all other Agricultural courses. Study of the more important orders of

flowering plants; historical survey of various systems of classification; study of groups by means of some representative, the herbarium of the college affording material for this purpose. Prerequisite, Course 1. Three to five hours credit. Lectures, two hours and laboratory three to nine hours per week. Fee, $3.00 or $5.00.

16. Poisonous Plants. Required second semester Freshman year in Veterinary Course. Study of poisonous plants from historical standpoint, with brief history of toxicology, ptomaine poisoning and poisoning by toxins and other agents—beginning with the poisonous fungi and extending through the higher plants in systematic order. The course is intended to acquaint veterinarians with the plants responsible for poisoning animals. Two hours credit. Lecture, one hour and laboratory three hours per week. Fee, $3.00.

17. Advanced Cryptogamic Botany, Ferns. Elective first semester Junior or Senior year in Science courses. Morphological and Systematic study of ferns and their allies. Prerequisite, Course 4. Three hours credit. Lecture, one hour and laboratory six hours per week. Fee, $2.00.

18. Botanical Seminar. Elective first or second semester Junior or Senior year in Science courses. Recent literature and topics of botanical interest are reported and discussed by members of seminar, each member reporting on some assigned topic at least once every two weeks. Lectures are also given by members or by some scientist under the auspices of the seminar. One hour credit.

19. Evolution of Plants. Elective first semester Junior or Senior year in all Agricultural and Science courses. Study of theory of evolution of plants, heredity, mutation, Mendelian laws, present and past distribution of plants as related to origin of species. Prerequisite, Course 15. Two hours credit. Recitation, one hour and laboratory three hours per week.

20. Botanical Microscopy and Micro-Chemistry. Elective second semester Junior or Senior year in Science courses. Detailed study of microscope and its accessories and their use in research work; the chemistry of the cell with methods of determination of cell contents and ultimate fate of cell nutrients. Three hours credit. Lecture, one hour and laboratory six hours per week. Fee, $3.00.

22. Botanical Drawing and Illustrating. Elective first semester Junior or Senior year in Science courses. Preparation of drawings to illustrate papers for publication; methods of making drawings and technical requirements of drawings intended for photographic reproduction; use of camera lucida; the determination of magnification and drawing from microscopic mounts. Two hours credit. Lecture, one hour and laboratory three hours per week.

23. Thesis. Elective for students qualified in Botany. Consists of original research along line of any preceding courses, laboratory work, preparation of bibliographies, reviewing literature pertaining the subject, and conferences with those in charge. Credit from one five hours per week.

24. **Plant Embryogeny.** Elective first semester Sophomore year General Science Course. Required second semester Senior year in Hor- ulture,, second semester Senior year in Science and Agriculture, and re- ired second semester Junior year in Agronomy and Animal Husbandry ourses if student elects Horticulture 4. The phenomena of cell division, e nuclear changes of the cell at different stages in its growth, a survey f life history of various groups of plants beginning with liver-worts, the radual development of the alternation of generations in various types, e homologies of the parts of flower and its various contained structures, rocesses of maturation of germ cells, growth of the gametophytic gen- ration and the final process of fertilization and the consequent develop- ent of embryo, cytological explanations of the laws of Mendel, of arthogenesis, of xenia, and polyembryony, also the study and verifica- on of lectures by study of a series of slides. One hour credit. Fee, 1.50.

25. **Microscopical Examination of Foods.** Elective second se- ester Junior or Senior year in all Agricultural courses. This course em- races a study of vegetable foods from the standpoint of microscopy ith especial reference to the adulteration of same. It takes up the istological elements of plants such as tissues and cell contents. A icroscopic study of flour, and meal, impurities and adulterations, and e microscopic characters of the cereals such as wheat, oats and corn. study of weed seeds and screenings; oil seeds and oil cake. A micro- copic study of legumes like the common bean, pea and vetch; other ruits like the apple, pear and quince; cucurbit fruits; tubers, spices and ondiments, like pepper, cubebs, cinnamon, nutmeg and mace. Lectures nd laboratory work. Reference book, "The Microscopy of Vegetable oods," by Winton and Moeller. Two hours per week.

26. **Ecology.** Required second semester Sophomore year n Animal Husbandry Course. Treats of the relation of plants to their nvironments, under the factors water, heat, light, air, soil, and animals; onsidering the anatomical structures of plants, especially with reference o environment. The pollination of some economic plants like maize, heat, clover, rosaceous and leguminous plants; the dissemination of lants. Symbiosis. Myrmecophytes. Two hours credit. One lecture and ne laboratory. Fee, $2.00.

27. **General Botany.** Elective first semester Freshman, Soph- more, Junior or Senior in General Science Course. A study of the gen- ral morphology with a short resume of the systematic arrangements of mportant members of five divisions of the plant kingdom; also a brief onsideration of some of the functions of plants, under the head of the tability of plant bodies, the movements, nutrition, growth and reproduc- ion. Reference books, Strasburger, Noll, Schenck, and Karsten. A text- ook of Botany; Stevens' Plant Anatomy. Five hours credit. Lectures, our hours and laboratory three hours per week. Fee, $3.00.

28. General Botany. Elective second semester Freshman, Sophomore, Junior or Senior in General Science Course. A study of the special morphlogy of the plant beginning with the cell, its structure, parts, the inclusions of protoplasm, such as starch, aleurone and crystalline matter; a brief account of the ontogeny of the cell and cell fusion; also a study of the tissues and tissue systems and their functions. Prerequisite, Course 27. (Reference books same as Course 27). Five hours credit. Lectures four hours and laboratory three hours per week. Fee, $3.00.

29. General Botany. Required first semester Freshman in Domestic Economy Course. In this course the relation of plants to their environment is considered, and the pollination of flowers by the insects, wind and other agencies, dissemination of plants, and a study of the different plant formations. This part of the work will be followed by a study of the use of the microscope, a study of the cell and its contents such as starch, protoplasm, nucleus and crystals, tissues and tissue systems. These structures are taken up from physiological standpoint, the use and function of the different plant structures is considered, and the absorbing, assimilating, aerating, and conducting systems are considered. Five hours credit. Four lectures and one laboratory. Fee, $3.00.

COURSES IN GENERAL BACTERIOLOGY.

30. General Bacteriology. Elective first semester Sophomore, or Junior in all Science Courses, and elective Junior or Senior in all Agricultural courses. Lectures on the morphology, classification, physiology and cultivation of bacteria; relation of bacteria to health of man and animals, infection, contagion, immunity, relation of bacteria to decay, as cause of plant diseases and other scientific and agricultural problems. Laboratory work consists of methods of cultivating bacteria, their functions and activities, and of the solution of specific problems, as the bacterial content of air, water and food with interpretation of results reached. Four hours credit. Lectures, two hours and laboratory six hours per week. Fee, $5.00.

31. Bacteriology of the Pathogenes. Required first semester Junior year in Veterinary Course. Study of morphology, classification, cultivation, physiological characters of bacteria; study of pathogenic bacteria especially those infecting domestic animals, their cultural character, the principles of infection and contagion, and the treatment of various theories of immunity as related to bacterial infections; also discussion and preparation of anti-sera. Two hours credit. Lecture, one hour and laboratory three hours per week. Fee, $5.00.

33. Technical Bacteriology. Elective first semester Senior year in Civil Engineering. Study of morphology, relationships and cultural characters of bacteria of water and water supplies, as the common water bacteria, the pathogenic types, and those active in putrefaction and purification, also some of the algae which contaminate water supplies and produce unpleasant odors and tastes; the methods used to determine their presence; qualitative and quantitative tests of waters, and a study of nedia used in bacterial analysis. Three hours credit. Lecture, one hour and laboratory six hours per week. Fee, $5.00.

34. Bacteriology of the Pathogenes. Elective first semester Junior or Senior year in Science courses. Similar to Course 31, the extended time permitting study of bacteria pathogenic to man as well as to animals. Prerequisite, Courses 30 or 38. Four hours credit. Lectures, two hours and laboratory six hours per week. Fee, $5.00.

35. Fermentations. Required second semester Junior year in Domestic Economy, elective second semester Junior or Senior year in General Science Course. The bacterial decomposition of foods, causes and methods of preventing formation of poisonous products; economic fermentations, as wine, beer, vinegar, koumiss; the vegetable enzymes, their activities and products; molds, bacteria and yeasts as related to the preservation and fermentation of foods; also the common molds. Two hours credit. Prerequisites, Courses 30 or 38. Lecture, one hour and laboratory three hours per week. Fee, $3.00.

36. Advanced General Bacteriology. Elective second semester Junior or Senior year in all Agricultural and Science courses. Advanced work in the biology and physiology of bacteria, especially certain of pathogenic forms; also the recent investigations in immunity, serum therapy and the prevention of disease. Intended to fit students to do original or special work in experimental, general or pathological bacteriology. Prerequisites, Courses 30 or 38. Four hours credit. Lectures, two hours and laboratory, six hours per week. Fee, $5.00.

37. Advanced Sanitary Bacteriology. Elective first semester Junior or Senior year in Science courses. Primarily a study of bacteria of water, study of specific instances of polluted water supplies and of problems that have been solved in the disposal of sewage and other wastes by means of bacteria, Prerequisites, Courses 30 or 38. Three hours credit. Lecture, one hour and laboratory six hours per week. Fee, $5.00.

38. General Bacteriology. Required first semester Junior year in Domestic Economy Course. Lecture, one hour and laboratory three hours per week. Fee, $5.00.

39. Thesis in Bacteriology. This work may be elected in this department and taken under any of preceding subjects, the credit varying from one to three hours depending on the nature of subject and time required.

40. General Bacteriology. Required second semester Junior year in Agronomy, Dairying, and Science and Agriculture and second semester Senior in Horticulture. Two hours credit. Fee, $5.00.

Post Graduate Work in Botany and General Bacteriology.

Major or minor post graduate work may be taken in this department along any of the following lines.

(a) **Advanced Ecology.** A study of factors underlying floristic distribution and phytogeographic nomenclature, the relation of plants to environment and a thorough study of economic relationships of some flora, applying the principles named above.

(b) **Advanced Physiological Botany.** A study of some specific problems in plant physiology.

(c) **Advanced Vegetable Cytology and Histology.** A study of comparative anatomy of some group of plants or of some specific problem in cell life and its activities.

(d) **Advanced Systematic Cryptogamic Botany.** A systematic study of some group of the flowerless plants.

(e) **Advanced Systematic Phanerogams.** Study of some group of the phanerogams or of the flora of some locality.

(f) **Advanced Economic Botany.** Study of some specific problem of particular interest as the adulteration of foods, seeds; geographical botany, etc.

(g) **Advanced Mycology.** A specific study of some group of plant diseases, or of the disease affecting some plant of a group of related plants.

(h) **Water Analysis.**

(i) **Advanced Fermentations.**

(j) **Advanced Bacteriology of the Pathogenes.**

DEPARTMENT OF ZOOLOGY.

HENRY E. SUMMERS, PROFESSOR.
JOSEPH E. GUTHRIE, ASSISTANT PROFESSOR.
C. E. BARTHOLOMEW, INSTRUCTOR.
H. NESS, ASSISTANT.

Equipment. The laboratory is well supplied with the usual apparatus, including compound and dissecting microscopes, camera-lucidas, microtomes, incubators, paraffin baths, aquaria, etc. In the way of illustrative material, in addition to the general museum and the entomological collections described below, there is a large series of charts, a set of wax embryological models, lantern slides, mounted microscopic slides, disarticulated and articulated skeletons, and alcoholic and formalin preparations.

The general museum consists of specimens selected with great care to show the variation of structure found in the various branches, classes and minor divisions of the animal kingdom. Porifera, coelenterata, vermes, echinodermata, arthropoda, mollusca and vertebrata are amply represented by actual specimens and Blaschka glass models. It is especially rich, however, in representative birds and mammals. In addition to a good series of skeletons, there are mounted skins of about two hundred, and eggs of over two hundred species of birds, and over ninety mounted skins of mammals, the later including such rare or peculiar forms as the echidna, ornithorhynchus, great kangaroo, kaola, wombat, sloth, great ant-eater, armadillo, manatee, peccary, camel, anteope, bison, Rocky Mountain goat and sheep, elk, tapir, porcupine, beaver, fur seal, hedgehog, lemur and monkey.

The collection of insects is very large, embracing about sixty thousand mounted specimens, including a large number of types. It includes the Van Duzee collection of Hemiptera, including the types of numerous species described by him. There is also a large series of microscopic forms on slides, and a large amount of material illustrating life histories, especially of injurious insects.

The work in Zoology is designed, first, to give a knowledge of those biological laws, together with the data necessary for their thorough comprehension, which is today regarded as an essential part of a liberal education; secondly, to furnish the requisite theoretical basis for an intelligent study of certain practical branches of stock breeding, dairying, human and veterinary medicine, and economic entomology, which depend directly upon zoological principles; and, thirdly, to impart a knowledge of the facts and methods of investigation in the last of these practical subjects, namely, economic entomology.

COURSES IN ZOOLOGY.

2. **General Zoology.** Elective first semester Freshman, Sophomore, Junior or Senior in General Science Course, and in Junior or Senior of all Agricultural courses. Required first semester Sophomore year in Domestic Economy and Animal Husbandry Course. This together with Zoology 3, is designed to give an outline knowledge of the entire animal kingdom, as well as of the more important biological laws. The laboratory work includes a thorough study of the structure of the grasshopper, followed by a comparative study of certain parts of the beetle. The lectures during the corresponding time deal with those facts in the physiology and life history of insects that will best serve as a foundation for a knowledge of the general laws of animal life. This, followed by a study of the crayfish and crab, gives a basis for comparison between the Crustacea and Insecta. The earth worm is next studied, the lecture work dealing with the relations of animals to their environment. Vertebrates are next studied, the lecture work dealing with the anatomy of the shark and the lectures with general vertebrate physiology, including the fundamentals of embryology. The study of the vertebrate is continued by examination of the perch, necturus, frog, turtle, bird and mammal. The Protozoa are next studied, the lectures dealing with the origin of the physiological functions as exhibited in this group. Then a study is made of selected types of the different phyla of the animal kingdom, taken up in regular order until the vertebrates are again reached. Five hours credit. Lectures, three hours and laboratory, six hours per week. Fee, $3.00.

3. **General Zoology.** Elective second semester Freshman, Sophomore, Junior or Senior in General Science and Junior or Senior in all

the Agricultural courses. Required second semester Sophomore year in Domestic Economy and Animal Husbandry Courses. Continuation of Course 2. Five hours credit. Lectures, three hours and laboratory, six hours per week. Fee, $3.00.

4. **General Entomology.** Required first semester Junior year in Horticulture, Agronomy and Science and Agriculture, elective first semester Junior or Senior year in all other Agricultural courses and first semester Junior or Senior year in Science courses. A study of the structure, habits, life history and classification of insects, designed as an introduction to the subject for those intending to make a specialty of entomology and as a foundation for the practical work in economic entomology offered in Courses 17 and 18. Includes a detailed study of certain representative forms, beginning with the grasshopper, and the field study, collection and classification of as many species as possible representing different orders. The lectures include the general principles of the physiology and development of insects and the detailed life history of representatives of all the different orders: Prerequisite, Zoology 3 or 16. Five hours credit. Lectures, two hours, and laboratory, six hours per week. Fee, $3.00.

5. **Embryology.** Required first semester Junior year in Veterinary and Animal Husbandry, elective first semester Junior or Senior year in Domestic Economy and all other Agricultural courses and first semester Sophomore, Junior or Senior year in General Science course. The laboratory work is devoted to a study of the development of the frog and of the chick from preparations made largely by the student, supplemented by others furnished for comparison by the instructor. The methods of making reconstructions from sereal sections may be learned. In the lectures the general principles of development are discussed beginning with the structure of the germ cells, maturation, fertilization, and tracing the modifications of cleavage and gastrulation found in the different classes of vertebrates. Prerequisites, Zoology 3 or 15. Two lectures and one laboratory period per week in Veterinary and Animal Husbandry, two lectures and one to three laboratory periods per week in other courses. Fee, $3.00.

6. **Evolution of Animals.** Required second semester Senior year in Animal Husbandry, elective second semester Junior or Senior year in the Science and in all the Agricultural courses. A discussion of problems and factors of organic evolution, heredity, variation, origin and distribution of life. Prerequisite, Zoology 3. Lecture, one hour per week.

7. **Comparative Anatomy.** Elective second semester Sophomore, Junior or Senior year in all Science courses. Advanced work on the comparative anatomy of the chief systems of organs of vertebrates designed especially to give an understanding of mammalian morphology as derived from that of lower vertebrates. Prerequisites, Zoology 3 and 5. Five hours credit. Three lectures and two laboratory periods per week. Fee, $3.00.

8. Animal Parasites. Required second semester of Junior year in Veterinary and Animal Husbandry courses, elective second semester Junior or Senior year in Science and Agricultural courses. Study of more injurious parasites of domestic animals. Intended especially for Veter-nary students. Prerequisite, Zoology 2 or 15. Two lectures and one aboratory per week in Veterinary Course, two lectures in Animal Husbandry and Science courses.

10. Morphology. Elective first or second semester Junior or Senior in Science or Agricultural courses. Special individual work in continuation of Courses 2, 3, 5, and 7 or 4, 17 and 18, designed especially for those who expect to become teachers and investigators in Zoology and who are writing their thesis in this department. The work will be given a leaning toward general vertebrate or invertebrate morphology, embryology or taxonomy, depending upon the inclination of the student. Three to five laboratory periods per week. Fee, $3.00.

11. Neurology. Elective first semester Junior or Senior year in Science courses. The comparative morphology of the vertebrate nervous system, especially the physiological anatomy of the human brain. Prerequisite, Zoology 5. Two lectures and one to three laboratory periods per week. Fee, $3.00.

12. Human Physiology. Required first semester Junior year in Domestic Economy course and elective first semester Junior or Senior year in General Science Course. Study of the chief functions of the human body, and the laws of health, preceded by a study of mammalian anatomy including histology. Prerequisites, Zoology 3 and Chemistry 9. Five hours credit. Three lectures and two laboratory periods per week. Fee, $3.00.

13. Human Physiology. Required second semester Junior year in Domestic Economy course and elective second semester Junior or Senior year in other Science courses. Continuation of Course 12. Five hours credit. Three lectures and two laboratories. Fee, $3.00.

14. Advanced Invertebrate Zoology. Elective second semester Sophomore, Junior or Senior year in Science Courses. Study of the structure and development of representatives of invertebrate groups not fully discussed in previous courses; the embryology and anatomy of Echinodermata, the development of a marine worm, the types of Mollusca, Arachnida and Ascidia. Special attention is paid to models of respiration, kinds of respiratory apparatus, and also to special sense organs in Pecten, Loligo, etc. Prerequisite, Zoology 5. Two lectures and one laboratory period per week. Fee, $3.00.

15. General and Vertebrate Zoology. Required first semester Sophomore year in Veterinary course. A study of the anatomy of the grasshopper gives a knowledge of Zoological laboratory methods as well as the general structure of insects; a study of the anatomy of the shark serves as an introduction to methods of gross dissection, and of the general morphology of vertebrates. Other vertebrate types, especially the necturus, are studied. The lectures include general animal physiology, and an outline of the comparative anatomy of some of the chief organs of the vertebrates and of elementary vertebrate embryology. Five hours credit. Lectures, three hours and laboratory, two periods per week. Fee, $3.00.

16. **General Zoology.** Required second semester Sophomore in the courses in Horticulture, Agronomy and Science and Agriculture. This course is intended to serve as an introduction both to general animal morphology and physiology, and to the more special work in Entomology required of students in the above courses. The study in the laboratory of the grasshopper, followed by that of a fish, usually the shark, serves as a foundation for the lecture work on the general principles of Zoology, including physiology and development. Five hours credit. Lectures, three hours, and laboratory work six hours per week. Fee, $3.00.

17. **Economic Entomology.** Elective in the first semester of the Junior or Senior year of the Agricultural and Science Courses. Intended particularly for students in Horticulture and Agronomy. A detailed study in field, insectary, and laboratory of the chief economic species of insects found in Iowa, accompanied by a study of the literature relating to the other more important American species. This course forms the first part of a study of the life histories of our common species of insects which it is necessary to begin in the spring, and which cannot be completed until autumn. It must therefore be followed by Course 18 in the succeeding autumn. Credit towards graduation is not given for either of these two courses separately. Prerequisite, Zoology 4. Three hours credit. Two lectures and three hours laboratory work. Fee, $3.00.

18. **Economic Entomology.** Elective second semester Junior or Senior year of the Agricultural or Science Courses. This course is described above under 17. Two hours credit. Six hours laboratory work. Fee, $3.00.

SPECIAL COURSES.

In addition to the above, special courses will be offered to students intending to write a thesis in Zoology, and also for graduate students in continuation of the work pursued as under-graduates. Special facilities will be offered for such research work. No one will be permitted to write a thesis in this department who has not completed by the end of the Junior year, work in the line in which he wishes to carry on his thesis investigation, at least up to or including Courses 7, or 3, 17 and 18, or 12 and 13, or 14.

DEPARTMENT OF GEOLOGY.

SAMUEL WALKER BEYER, PROFESSOR.
IRA A. WILLIAMS, ASSOCIATE PROFESSOR.

The work of this department is conducted by means of recitations, lectures, conferences, laboratory work, and field excursions. The student is thus afforded an opportunity not only to gain a familiarity with the principles and theories discussed in the leading text-books, but is also encouraged to test these theories and verify the principles discussed in the class room. Field excursions, with carefully written reports are required in all the courses in Geology.

The department of Geology together with the department of Mining Engineering occupies quarters in Engineering Hall. The working equipment consists of museum materials, field and laboratory instruments.

The museum contains carefully selected series of fossils, minerals, rocks and ores, all available for study purposes. Among the more important collections are the educational series of rocks collected by the United States Geological Survey; the Smithsonian collection of rocks and minerals; the Rohn, Hodson and Young collections of rocks and ores from the Lake Superior region; the English mineral collection, containing two hundred specimens and one hundred and fifty species; the Baltimore series of more than two hundred specimens of rocks and minerals typical of the petrographic province of Baltimore; the Cushing collection from Clinton County, New York; and a considerable amount of material to illustrate the physical features of rocks and minerals.

In paleontology, the Calvin collection of paleozoic fossils; a large collection of Coastal Plain fossils, principally from the Cretaceous of New Jersey, the Eocene of Alabama and Maryland, and the Miocene of Maryland and Virginia; the Permo-Carboniferous series from Kansas and Russia; and the coal plants of Iowa, Illinois and Pennsylvania are the most important.

In applied Geology the department possesses comprehensive series of lead and zinc ores with their characteristic gangue minerals from Joplin, Missouri, and from the Iowa-Wisconsin area; copper and iron from the Lake Superior region and from the celebrated localities in the Ural mountains; copper, manganese and silver from Butte, Montana; lead, silver and gold from Colorado, Nevada and California.

Aside from the collections enumerated, Dr. H. Foster Bain, formerly of the Iowa Geological Survey, has kindly loaned to the department his extensive private collection of rocks and minerals; and the Le Grand Quarry Company generously donated a splendid series of building blocks from their quarries which exhibit the various styles of stone dressing.

The laboratory is supplied with four Bausch and Lomb petrographical microscopes; one Fuess, medium model, latest pattern petrographical microscope. All of the instruments are well supplied with accessories; one Ward mineral dresser, one hand goniometer; one set Preston's celluloid crystal models; one set Krantz selected wood models, exhibiting complicated forms; the Krantz collection of 120 thin sections of the common rock-forming minerals selected and arranged according to Rosenbusch, the collection selected to show the various representative characters of minerals and rocks; one section slicing machine, the complete apparatus for rock separations by heavy solutions; and is supplied with apparatus for doing all kinds of photographic work. A considerable number of instruments for reconnoissance and field work in Geology are owned by the department.

The lecture equipment comprises a Hitchcock's geological map of the United States; one set of Kiepert's physical maps; numerous maps and charts of the United States Geological Survey and of the Mississippi River Commission and an elaborate series of lantern slides and photographs.

COURSES IN GEOLOGY.

All of the courses in geology save numbers 2, 803 and 6 are designed especially to meet the requirements of students who elect the courses in Mining Engineering and Ceramics. At the same time, the courses given will afford a good groundwork for students who expect to teach the subject or make Geology their profession. Course 803 is especially adapted for students in Civil Engineering who have not the time to take the more complete work. Course 6 is offered for those who desire a broad view of world geography and it is hoped to make the course helpful to those who expect to teach History, Politics, Geography or Geology.

2. **General Geology continued:** Historical and Stratigraphic geology. A continuation of Course 501, and completes the work in general geology. Counts four hours per week, and consists of three recitations and lectures and one class hour devoted to laboratory and field work. Optional second semester Junior or Senior year in all courses in Science and Agriculture. Prerequisites, Geology 501, and one or more semesters work in Zoology and Botany.

6. **Advanced Physiographic Geology.** Elective second semester Junior or Senior year in all courses in Science and Agriculture. This course is devoted to a study of the evolution of the physical features of the earth, and the leading agencies which influence their developments. Counts four hours per week and consists of three recitations and one laboratory or field period per week. Prerequisites, elementary courses in Chemistry and Physics.

9. **Meteorology and Climatology.** Elective second semester Junior or Senior in Agricultural and Science courses. The object of the course is to give the student a knowledge of the fundamental principles which govern weather and climate. The first half of the term is devoted to a study of the elementary principles of meteorology. The student is acquainted with the instruments used by the weather bureau, the principles upon which they are based, and their care and uses are explained. The last half of the term is given to a consideration of the fundamental principles which control weather and climate. Throughout the entire course the charts and maps issued by the state and federal weather bureaus are used freely. The student is given practice on the construction and interpretation of charts and in forecasting. Two hours credit.

501. **General Geology: Dynamic, Structural and Physiographic Geology.** Required first semester Junior year in Mining Engineering and Ceramics, and Elective first semester Junior or Senior years in

all Science and Agricultural courses. The course includes a study of the principles which form the groundwork of the Science and is given by means of recitations, lectures, laboratory, and field work. Counts four hours per week, three of which are devoted to recitations and lectures, and one to laboratory and field work. Prerequisites, one or more semesters each of Chemistry and Physics. Text-book, Scott's Introduction to Geology, 2nd Edition.

607. Mineralogy. Required second semester Junior year in Mining and elective second semester Junior or Senior year in all courses in Science and Agriculture. The first half of the term is devoted to a study of the morphological and physical characters of crystalline substances, while the last half is devoted to descriptive and determinative mineralogy. The course counts four hours and consists of four two hour sessions. Prerequisites, elementary courses in Mathematics, Chemistry and Physics.

704. Advanced Geology. Petrologic and Advanced Structural Geology. The first ten weeks of the term are devoted to a study of rocks, their origin, occurrence and association, and the last six weeks to a discussion of principles and problems in Structural geology. The course counts four hours per week and includes three hours class work and one laboratory or field period per week. Required of all students in the courses in Mining Engineering and Ceramics. Optional in all courses in Science and Agriculture. First semester, Senior year. Prerequisites, Geology 501 or 803.

803. Engineering Geology. Required second semester Senior year in the course in Civil Engineering. The course includes a discussion of the fundamental principles of dynamic and structural geology and a study of the common minerals and rocks, especially those important in structural materials. Counts three hours per week and consists of recitations, lectures, laboratory and field work. Prerequisites, Elementary Chemistry, Mechanics and Heat. Textbook, Scott's Introduction to Geology, 2nd Edition.

805. Economic Geology. The first ten weeks includes a study of the nonmetallics while the remainder of the term is devoted to a study of the ore deposits of the United States, Canada and Mexico. Especial stress is put upon the principles which govern the mode of occurrence, association and origin of the leading economic products. Counts four hours and consists of three recitations and one laboratory or field period per week, second semester, Senior year. Required of all students in the courses in Mining Engineering and Ceramics, and optional in all courses in Science and Agriculture. Prerequisites, Geology 501 or 803, and 704.

808. Thesis. Students in Mining Engineering electing to write a thesis in geology are required to take five hours special work in geology during the second semester Senior year. This special work may be along any one of the following lines: Economic Geology, Petrology, Dynamic Geology, Structural Geology, Metamorphism, Historical Geology or Stratigraphic Geology.

DEPARTMENT OF ECONOMIC SCIENCE.

BENJAMIN H. HIBBARD, PROFESSOR.

JOHN E. BRINDLEY, INSTRUCTOR.

Economic Science has become a well recognized part of almost all scientific and technical education, because it has made itself useful in investigating and interpreting the material phenomena and facts of every day life; inductive methods are given first place, deduction being used with caution.

It is the purpose of the department to develop courses of special value to the technical departments of the college. Agricultural and engineering economics are receiving primary attention, and it is believed that the work done in these classes will be helpful in meeting the growing economic problems of the state.

1. **Outlines of Economics.** Elective in first semester Junior or Senior in all Science and Agricultural courses. In this course a text is followed, and additional work supplied by lectures. Five hours credit.

3. **Economic Problems.** Elective first semester Junior or Senior year in all Agricultural and Science courses. Study of socialism, monopolies and trusts. Text-book, Ely's "Socialism and Social Reform." Prerequisite, Course 1 or 9. Three hours credit.

4. **Money and Banking.** Elective second semester Junior or Senior year in all Agricultural and Science courses. Text-book, White's "Money and Banking," supplemented by reading, reports and lectures. Prerequisite, Course 1 or 9. Two hours credit.

5. **Finance.** Elective second semester Junior or Senior year in all Agricultural and Science courses. Text-book, Adams' "Science of Finance." Prerequisite, Course 1 or 9. Three hours credit.

6. **Industrial History of United States.** Elective second semester Junior or Senior year in all Science and Agricultural courses. Lectures and class reports. Prerequisite, Course 1 or 9. Two hours credit.

7. **American Labor.** Elective in first semester Junior or Senior year in all Agricultural and Science courses. A study of labor questions by class reports and lectures. Prerequisite, Course 1 or 9. Two hours credit.

9. **Outline of Economics.** Required the first semester Sophomore year in Science and Agriculture, Horticulture and Forestry, and first semester Junior year in Agronomy and elective Junior or Senior in all other Agricultural courses; required first semester Senior in Mechanical Engineering, and Electrical Engineering, and second semester Junior in Civil Engineering. Elective in Domestic Economy and optional in Mining Engineering. Text and lectures. Three hours credt.

10. **Agricultural Economics.** Optional second semester Sophomore year in Science and Agriculture, Horticulture and Forestry and Dairy courses. Elective second semester Junior or Senior year in all other Agricultural courses. This course will consist of lectures and class

reports. The topics discussed will include historical and comparative agricultural systems; land tenure; size of farms; coöperation; taxation; prices; transportation; marketing; land credit, the relation of the state to agriculture. Prerequisite, 1 or 9. Three hours credit.

11. State and Local Taxation. Elective second semester Junior or Senior for all Science and Agricultural courses. This is primarily a research course, the work being conducted in the form of lectures and class reports. Special attention is given to taxation in Iowa. Prerequisite, Course 5. Two hours credit.

12. Engineering Economics. Optional in engineering courses. The economic side of transportation will be given a prominent place. The industrial aspects of irrigation, improvement of inland waterways, municipal utilities, etc., will be studied. An earnest effort will be made to shape this course so as to meet the special needs of engineers Prerequisite, Course 1 or 9. Two hours credit.

13. Seminar. Elective second semester Junior or Senior Science courses to students who have had not less than two previous courses. The purpose of this course is to awaken interest in the general field of economics by following the current events and reading economic magazines. A sketch of economic thought is presented in lectures. One hour credit.

DEPARTMENT OF DOMESTIC ECONOMY.

ALICE DYNES FEULING, PROFESSOR.
HELEN DONOVAN, ASSOCIATE PROFESSOR.
RUTH MORRISON, ASSISTANT PROFESSOR.
MABEL CAMPBELL, INSTRUCTOR.
LOUISE LAURANCE, STUDENT ASSISTANT.
EDITH G. CHARLTON AND NEALE S. KNOWLES, EXTENSION WORKERS.

The widespread interest in Domestic Economy springs largely from the increasing attention accorded to all social problems. The importance of the home as a social factor is paramount; and the application of science and of the scientific method to household management is coming to be regarded as a necessity. It is not surprising therefore that the study of the home, its function, its administration, its sanitary conditions, the preparation of foods, and a score of kindred topics should find place in the courses of instruction in colleges and universities. The study of Domestic Economy is profitable not only because of its practical worth, but because of its educative value. Many sciences find direct application in the operations of housekeeping; it is consequently the aim of this department to present this home-study in such a way as to apply the knowledge gained in related and associated sciences. This study seeks at every point the health, convenience and comfort of the members of the household, and by its utility to add to the value of the well kept home.

The methods of instruction embrace the lecture system, text-book study, laboratory practice, demonstration lessons, class discussions, presentation of topics on assigned subjects by individual members of the class, and expeditions for observation and criticism. By a judicious combining of theory and practice, science and art, the student gains a thorough understanding of the underlying principles of Domestic Economy and at the same time acquires skill and deftness in execution. Upon completing a systematic course in this department a young woman is prepared to conduct her home successfully and with that ease which comes only through knowledge and experience.

The work of the Domestic Economy department is that of applying the principles of the related sciences, Botany, Zoology, Chemistry, Physiology and Physics to the every day problems of the home. It does not constitute a special and separate course of study, but is one of the several lines included in the general College courses offered to women students and subject to the usual regulations concerning entrance requirements, classification, examinations, and class records.

Students are advised not to enter in the second semester for the purpose of taking beginning work in Domestic Economy, for there are no beginning classes at that time. The work of the second semester is a continuation of the work of the first semester.

Domestic Economy 8, 22, 23, 35, 36, 37 and 38 give science credit in Junior or Senior years in General Science course.

A course in Domestic Economy is offered during the winter vacation for the benefit of the women of the state who are unable to take a college course. Lessons, including actual laboratory work, in sewing, cooking and chemistry of foods are offered. Lectures are given in home nursing, home decoration and artistic dress. There are no prerequisites for this course. Fee, $3.00.

This department employs two extension workers who teach Domestic Economy throughout the state under the direction of the Agricultural Extension Department.

COURSES IN DOMESTIC ECONOMY.

Domestic Science.

8. **Laundry Work.** Required first semester Senior in Domestic Economy and elective Junior or Senior in General Science course. Study of soaps, washing fluids, bleaching powders, bluings and starches; their scientific and practical relation to laundry work, also actual work in the laundry. Prerequisite, Chem. 24. One hour credit. Laboratory, one period per week. Fee, $3.00.

9. **Theory and Practice of Teaching Domestic Science.** Elective first semester Senior year in Domestic Economy course. Treats of the purpose of Domestic Science in education, its relation to other subjects in the curriculum, methods of presentation, planning courses of study. Plans for furnishing and equipping laboratories in the various classes of schools and cost of same. The laboratory work consists of teaching public

school classes. Prerequisite, D. E. 35. Two hours credit. Recitation, one hour and laboratory, one period per week. Fee, $3.00.

10. Theory and Practice of Teaching Domestic Science. Elective second semester Senior year in Domestic Economy course. Continuation of D. E. 9. Two hours credit. Recitation, one hour and laboratory, one period per week. Fee, $3.00.

22. Sickroom Cookery and Home Nursing. Required second semester Senior year in Domestic Economy and elective second semester Senior in General Science course. A course of lectures including the furnishing, warming, and ventilating the sick room; bathing, dressing and administering food and medicine to patients; practical bandaging and bed making, lifting and caring for helpless patients; preparation and application of bandages, and the preparation of nourishing, palatable, and digestible dishes. Prerequisite, D. E. 36. One hour credit. Laboratory, one period per week. Fee, $3.00.

23. Home Management. Required second semester Senior in Domestic Economy and elective second semester Senior in General Science course. Includes care of dining room and pantry, cut glass, silver and cutlery; planning, buying, preparation and serving of breakfast, luncheon and dinners; food as an economical factor, the administration of the home. Prerequisite, D. E. 36. One hour credit. Laboratory, one period per week. Fee, $5.00.

27. Household Accounts. Required first semester Senior in Domestic Economy. One laboratory period. One hour credit.

30. Seminar. Elective second semester Senior year in Domestic Economy course. History of Domestic Economy movement and its effect upon education; the Domestic Economy work in other colleges and institutions of learning; its function in charity organizations, church work, Y. W. C. A., and public schools; special problems for investigation are assigned. One hour credit. Recitation, one period per week.

35. Food and Dietetics. Required second semester Junior year in Domestic Economy and elective second semester Junior or Senior year in General Science course. A study of the food principles, carbohydrates, proteids, fats and mineral matter; their chemical composition, digestibility, nutritive value and cost; the effects of cooking and the best methods of preparing and serving foods from a sanitary and dietetic standpoint; making standard dietaries appropriate to various conditions of occupation, climate, age and sex with limited cost; a study of foods suitable for old people and for children; the ethics of the dining room. The laboratory work includes a complete course in practical scientific cooking and serving of foods. This course aims to train students in the proper care and use of kitchen and dining room with their utensils and equipment. Emphasis is placed upon system, accuracy, neatness and skill. Prerequisite, Zool. 12. Five hours credit. Recitations, three hours and laboratories, two periods per week. Fee, $7.00.

36. Food and Dietetics. Required first semester Senior year in Domestic Economy and elective first semester Senior in General Science course. Continuation of D. E. 35. Prerequisite, D. E. 35. Five hours credit. Recitations, two hours and laboratory, three periods per week. Fee, $10.00.

37. Home Sanitation. Required second semester Junior year in Domestic Economy and elective Junior or Senior year in General Science course. Study of location and surroundings of the house, its plan, furnishing, and care from the sanitary standpoint, including drainage, disposal of household waste, heating, lighting, ventilating and water supply. Prerequisite, Botany 38. Two hours credit. Recitation, two hours per week.

38. Geography of Foods. Required second semester Senior year Domestic Economy and elective second semester Senior in General Science course. A study of production, transportation, preparation, adulteration and consumption of foods, also their market value as compared with food value. Prerequisite, D. E. 36. Two hours credit. Recitation, two hours per week.

Domestic Art.

1. Clothing. Required first semester Freshman year in Domestic Economy and elective in first semester Sophomore, Junior or Senior in General Science course. This course is designed to give knowledge of the various uses of hand and machine sewing, the use of patterns, the accurate taking of measurements, economical cutting of material, the making of garments. A study is made of the various fibres, the development of spinning and weaving, modern processes of manufacture, comparison of fabrics, ecenomic values. Two hours credit. Recitation, one hour and laboratory, one period per week. Fee, $1.00.

4. Clothing. Required second semester Freshman year in Domestic Economy and elective in second semester Sophomore, Junior or Senior in General Science course. Continuation of D. E. 1. Two hours credit. Recitation, one hour and laboratory, one period per week. Fee, $2.00.

6. Costume. Required first semester Sophomore in Domestic Economy and elective in first semester Junior or Senior year General Science course. In this course, each student makes an unlined cloth shirt waist suit. Lectures deal with the history of costume in its relation to modern dress, healthful and appropriate clothing, the work of the Consumer's League. Prerequisite, D. E. 4. Two hours credit. Recitation, one hour and laboratory, one period per week. Fee, $1.00.

7. Costume. Required second semester Sophomore year in Domestic Economy and elective second semester Junior or Senior in General Science course. Continuation of D. E. 6. Each student makes a light summer dress and thin white shirt waist. Topics for discussion: Art principles applied to costumes, color in its relation to dress, the effect of different textiles, artistic dress. Prerequisite, D. E. 6. Two hours credit. Recitation, one hour and laboratory, one period per week. Fee, $1.00.

11. History of Art. Elective first semester Senior year in Domestic Economy and General Science courses. Architecture and Sculpture. The organic and typical forms of architecture are studied with relation to their origin, character and development, and their particular adaptation to the existing conditions as to building materials and the needs and ideals of men. Sculpture is studied for its own perfection of beauty and grace and its use as an adjunct of architecture. Two hours credit. Recitations, two hours per week.

12. History of Art. Elective second semester Senior year in Domestic Economy and General Science courses. Continuation of D. E. 11 with Painting as principal subject. Two hours credit. Recitations, two hours per week.

13. Home Decoration. Required second semester Senior year in Domestic Economy and elective second semester Senior in General Science course. The principles of construction, ornamentation and color harmony are applied to furnishings and utensils and to the treatment of walls, floors and ceilings by means of lectures and specimens of textiles, wall papers, pottery, fine glass and silver. Prerequisite, D. E. 37. One hour credit. Recitation, one hour per week.

14. Theory and Practice of Teaching Domestic Art. Elective first semester Senior year in Domestic Economy course. This course considers the place of domestic art in education, its relation to the curriculum, problems of subject matter and of method, development of lesson plans. Practical work consists of assistance and teaching in public school classes. Prerequisite, D. E. 7. Two hours credit. Recitation, one hour and laboratory, one period per week. Fee, $3.00.

32. Theory and Practice of Teaching Domestic Art. Elective second semester Senior year in Domestic Economy course. Continuation of D. E. 14. Includes planning of courses for various schools, the problems of planning, furnishing, and equipping departments, relation to cost, the collection and use of illustrative materials. Prerequisite, D. E. 14. Two hours credit. Recitation, one hour and laboratory, one period per week. Fee, $3.00.

DEPARTMENT OF PSYCHOLOGY.

ORANGE HOWARD CESSNA, PROFESSOR.

Courses in Psychology.

NOTE—Credit for Psychology will be accepted toward a State Teacher's Certificate provided a sufficient amount be taken. Students desiring such credit should consult Professor Cessna before classifying.

1. Psychology. Elective first semester Junior or Senior year in all Agricultural and Science courses. Elements and outlines of Psychology. Standard text is used, supplemented by lectures and laboratory work. Recitations, five hours per week.

2. **Ethics.** Elective second semester Junior or Senior year in all Agricultural and Science courses. This course covers both theoretic and practical ethics and is based on standard texts such as MacKenzie's and Muirhead's Manuals. The text-books are supplemented by library work and lectures. Recitations, three hours per week.

3. **Advanced Psychology.** Elective second semester Junior or Senior year in all Science and Agricultural courses. This course treats of some of the advanced phases of psychology as suggestion, hypnotism, the subconscious self and the psychology of the crowd. Text-book, lectures and laboratory work. Prerequisite, Psychology 1. Three hours per week.

4. **Educational Psychology.** Elective in the first or second semester of the Junior or Senior year of the Domestic Economy course. This course is especially arranged for the Domestic Economy students. It is a brief course dealing with the practical psychological problems of teaching. It is based on James's "Talks to Teachers" and Bett's "The Mind and Its Education." Text-book, lectures and assignments. Three hours per week.

DEPARTMENT OF LITERATURE AND RHETORIC.

ALVIN B. NOBLE, PROFESSOR.
MISS MACLEAN, ASSISTANT PROFESSOR.
MISS MOORE, MISS TOMPKINS, MISS VAULX, MISS BAKER, MR. RAYMOND AND MISS JACOBS, INSTRUCTORS.

In the courses in English two ends are sought, utility and culture. Utility predominates in the first years and culture in the last, though there is hardly a recitation but contains something of both.

So long as man communicates his thoughts and feeling to his fellows, so long will language have a practical value. The man who speaks in a bungling manner, only half succeeds in communicating his thoughts to others. If they catch his real meaning they do it by a happy inference of their own as to what he meant to say. But no man can afford—certainly no college man can afford—to depend on others to correct his own faulty speech. If he uses the wrong word, arranges the parts of the sentence improperly, gives some part an undue emphasis, or fails to indicate clearly the bearing of one sentence upon another, his language does not truly present his thought, and the world may profit little from his attempt to state it. The more valuable his thought, the greater his need for a clear and effective use of language.

If the student has mastered grammar and rhetoric, that is if he has been trained to *apply* the principles gone over, his speech should be free from errors and inaccuracies of expression. More than this; if he has been directed to the study of good models, if he has been taught not merely to correct what is faulty, but also—and this is far more important—to appreciate what is excellent in diction, in sentence structure, in the levelopment of paragraphs and of whole compositions—if he has been nade to feel the increased utility, the beauty and the power of language s used by the masters of expression, he will not be content to use anguage that has only the negative merit of being without faults, but vill press on to attain a style enriched by the presence of real excellence, positive quality. Such language is not simply clear and accurate, it is leasing and powerful, and the man who has acquired such skill in the se of language has greatly increased his influence in the world. If he can ive his valuable thought an adequate expression, his fellows will learn the hought from him, and give him honor accordingly; if he cannot, they will learn it from one who can state it more clearly or more attractively, nd the reward is quite as likely to go the man who best states the thought s to the one who first discovers it.

The courses in grammar, rhetoric, and composition are devoted primarily to this utilitarian end. The facts and principles of language are studied, not as valuable in themselves, but as useful when applied in spoken or written discourse. To this end the student is required to write much, always with some definite object to be accomplished, and sually with some good model before him to inspire him to more earnest effort. When once he has learned to draw from his reading suggestions hat will be helpful in his future compositions, he has found a possible tility in everything he studies as literature and has opened the door to ontinual improvement. Moreover, in learning to appreciate what is best n the models set before him, he gains insensibly something of culture as well as of utility.

The course in debating is designed as a training toward the effective liscussion of live topics. Wherever he goes the college graduate is expected to have opinions of his own on the topics of the day, to be able o state them clearly and forcibly, and, if need be, to defend them. To his end he should train himself to close analysis of complex problems, o a severe testing of every conclusion, his own as well as other people's. Moreover, the public will not wait for him to retire to his study for labored preparation. They expect him to be ready when the occasion alls, and they have generous rewards for the man who is ready—ready o map out a clear-cut line of argument, ready to support it with proofs, nd able to present it clearly and forcibly in off-hand discussion. Such eadiness comes only from long-continued right-thinking and clear-speaking. It is the aim of this course to start the student toward this goal.

In the courses in Literature it is probably true that the culture side redominates, yet utility is seldom lacking. The study of Literature calls for close observation, correct inference, fine discrimination. When the mind is trained to do such work, it acquires a power that abides, a power that can be applied to any task. Literature deals with the whole range of uman experience, emotion, activity. In studying Literature, therefore, we are required to give some study to the mind and heart of man. If such study does not exert an elevating influence, it can only be because the reader does not choose the best, or does not approach the work in the right spirit. At the very least it ought to give him a deeper insight into human nature, and that is no small gain. But Literature is also an art, an art that engages the attention of more people, and holds that attention for a longer time than does any other art. In studying it, therefore, we are cultivating the aesthetic sense, a part of our nature not appealed to by most studies. Best of all, perhaps, it brings us into the company of the rarest minds of all times; it gives command of the best thought of the best minds; it brings to us the "blessed companionship of wise thoughts and right feelings." It broadens the mind, quickens the imagination, enlarges the sympathies, enriches the whole nature.

COURSES IN ENGLISH.

Academic Courses.

1. **The Sentence.** Required for entrance to all Academic courses by students who lack a thorough knowledge of sentence structure and sentence relations. Taught both semesters. This course is equivalent to the Grammar Review which has been recommended to the high schools of Iowa by the English Teachers' Round Table and the State Teachers' Association for the last year of the high school course. It assumes as a prerequisite such knowledge of grammar as students are supposed to obtain in the graded school and the first year or two of the high school, supplemented by two or more years of Latin, German, or other foreign language. It includes a review of the fundamentals, such as (a) the parts of speech, with their respective subdivisions; (b) inflections; (c) sentence functions and relations, such as subject, verb, complement, modifiers, prepositional and conjunctive elements, etc. The student is expected to have sufficient preparation to enable him to do this review work rapidly, in order that the major part of the term may be given to advanced work. This advanced work will include (a) correction of common errors; (b) study of the principles of punctuation, with drill in applying them; (c) copious analysis of good modern prose, with emphasis on phrases and clauses as structural elements in the sentence, and careful study as to correct and effective position and connection; (d) daily drill in sentence construction, in applying and supplementing what the student has been taught to observe in analysis; (e) original composition, with emphasis placed upon constructing clear and effective sentences of all types,—long, short, balanced, loose, periodic, and climatic. This course is designed to give the student that ready command of the sentence that shall leave him free to seek excellence of structure without needing to give conscious thought to correctness. Five hours credit. Fee, $.25

2. **Rhetoric and Composition.** Required first semester Academic year in all courses. This course assumes that the student has already had the major part of the ordinary high school course in rhetoric and composition, and also in literature. It emphasizes paragraph structure, the making of outlines, and the careful analysis of good models, accom-

anied by numerous exercises and essays designed to apply the methods ust analyzed. Prerequisites, English 1 or its equivalent, with the major art of a high school course in rhetoric and composition, and also in iterature. For the first ten days there will be a rapid review of gram- nar, with essays on simple themes. Students who show the need of fur- her review will be required to make up the deficiency. Text-book, Es- enshade's "Composition and Rhetoric." Five hours a week.

9. English Classics. Required second semester Academic in Science courses. A course in literature intended merely to supplement and omplete the study for those who have not finished a fully accredited our-year high school course. It is taken up mainly as an approach to a nore intelligent and discriminating appreciation of literature and an ncentive to a wider and more thoughtful reading. Prerequisites, English and 2, or their equivalent, and the major part of the course in litera- ure in a fully accredited high school, or its equivalent. Five hours credit.

12. English Classics. Required second semester Academic in ll Agricultural and Engineering courses. A course in literature intended nerely to supplement and complete this study for those who have not fin- shed a fully accredited four-year high school course. It is taken up nainly as an approach to a more intelligent and discriminating apprecia- ion of literature, and an incentive to a wider and more thoughtful read- ng. The authors and works studied will be selected with the view of epeating as little as possible of what the students have already studied. Prerequisites, English 1 and 2, or their equivalent, and the major part of the work in literature in a fully accredited high school, or its equiva- lent. Four hours credit.

COLLEGE COURSE IN ENGLISH.

7. Debating. Elective first semester Junior year in Engineering courses, and first semester Junior or Senior year in all Agricultural and Science courses. A course in stating and defining questions for debate, in making briefs, and in extemporaneous debating; the application of argumentative principles and methods to live topics. Prerequisites, the old courses, English 3, 4, 5 and 6, or the new courses, English 10, 11, and 12. One hour credit.

8. Debating. Elective second semester Junior year in Engineering courses and in Junior or Senior year in all Agricultural and Science courses. Continuation of course 7. One hour credit.

10. Narration and Description. Required first semester Freshman year in all Agricultural, Engineering, and Science courses. A study of good models in these two forms of discourse, with lectures on the principles to be observed and the methods to be employed; careful attention to making plans and outlines; an essay once a week, with an exercise almost daily; also constant emphasis on the ability of the student to apply in his own composition the principles studied. Prerequisites, English 1, 2, and Literature 9 or 12, taken in class or by examination, or diploma from a fully accredited high school. The first ten days will be given up to a rapid review of grammar, and essays on simple themes. Three hours credit. Fee, $.75.

11. **Exposition.** Required second semester Freshman year in all Agricultural, Engineering, and Science courses. Study and practice in expository writing, following same general method as in Course 10. Prerequisite, Course 10. Three hours credit. Fee, $.75.

12. **Argumentation.** Required first semester Sophomore year in all Engineering courses, in the courses in General Science, Agronomy, Dairying, Science and Agriculture. Required second semester Sophomore in the Animal Husbandry and Horticultural courses. Elective either semester in Sophomore year or later in Domestic Economy course. A study of the principles of argumentation, with analysis of good models. Practice in making briefs and in writing forensics. Prerequisite, English 11. Two hours credit. Fee, $.50.

COLLEGE COURSES IN LITERATURE.

1. **English Drama.** Elective first semester Junior or Senior year in all the Agricultural and Science courses; also in the Sophomore year Domestic Economy course. Devoted mainly to a study of Shakespeare, with a rapid survey, largely by reports and informal lectures, of the English Drama before his time, and a rapid reading of one or two dramas of subsequent time. In Shakespeare three or more plays will be studied carefully and others read rapidly. Character analysis and interpretation, with grouping and contrast. Plot analysis, with stages of complication and resolution. Prerequisite, English 11. Three hours credit.

2. **Epic and Lyric Poetry.** Elective second semester Sophomore Junior or Senior in Science courses, and in second semester Junior or Senior year in all Agricultural courses. A course in English poetry, excluding the drama. Principal attention given to Milton, Wordsworth, Tennyson, and Browning, with minor attention to Dryden, Pope, Burns, Coleridge, Shelley, and Keats. Classification of the various forms of poetry. Study of rhythm, meter, rhyme, alliteration, figures of speech, melody, harmony, etc. Principles of criticism applicable to the poems studied. Prerequisites, English 10 and 11. Literature 1 or 5, though not strictly necessary, will be of great help. This course may be divided into two parts, as Literature 10 and Literature 11. Five hours credit.

3. **Novel and Romance.** Elective second semester Junior or Senior year in all Agricultural and Science courses. A course in the novel and romance from the eighteenth century to the present time; differences between the two forms; comparison with the drama; plot and character analysis; an outline for systematic study. Prerequisites, same as in Literature 2; Literature 6 will also be of help. Three hours credit.

4. **American Literature.** Elective first semester Junior or Senior year in all Agricultural and Science courses. A study of our best poets and essayists; comparison with English authors and works; interrelations

f our literature and history; includes the prominent writers of the presnt day. Prerequisites, English 10 and 11; Literature 2 will be of help. hree hours credit.

5. The Drama. Elective first semester Sophomore, Junior, or enior year in Domestic Economy course, and in Junior or Senior General cience course. Combination of Courses 1 and 8. Prerequisites, English 0 and 11. Five hours credit.

6. The Short Story. Elective first semester Junior or Senior year n all Agricultural and Science courses. A study of the short story from he time of its development as a distinct literary form to the present ime; the various types and classes of the short story, with principal attenion to the product of the last fifty years in France, England, and the nited States. Prerequisites, English 10 and 11; Literature 1 or 5 is trongly urged as a preparation for this course. Two hours credit.

7. The Essay. Elective second semester Junior or Senior year n all Agricultural and Science courses. The leading English essayists, s Addison, Steele, De Quincey, Macaulay, Carlyle, Ruskin, and Matthew rnold. Prerequisites, English 10 and 11. Two hours credit.

8. The Drama in Translation. Elective first semester Junior or enior year in all Agricultural and Science courses. A study of the eading Greek, French, and German dramas through an English transation. May be taken as a part of Course 5 or independently. Prerequiites, the required courses in English. Two hours credit.

10. Epic and Lyric Poetry, 19th Century. Elective second semeser Junior or Senior year in all Agricultural and Science courses; also n Sophomore year in Domestic Economy course. Chief attention given to Vordsworth, Tennyson, and Browning, with a more rapid study of Coleidge, Keats, Shelley, and some of the later English poets. A part of ourse 2, but may be taken independently. Prerequisites, English 10 and 11. Three hours credit.

11. Epic and Lyric Poetry, 16th, 17th, and 18th Centuries. Elective in same semester and same courses as Literature 10, with same prerequisites. Chief attention given to Milton, with more rapid study of Dryden, Pope, Burns, and other minor writers. A part of Course 2, but may be taken independently. Two hours credit.

13. Literature. Elective first semester Junior or Senior years in all Engineering courses. A short course including so far as time permits a survey of the principal forms of literature, limited of course, to the masters in each field. In the fall semester emphasis will be placed upon the Short Story and the Novel. Aim, to distinguish between what is and what is not excellent, by fixing in mind the qualities that contribute to greatness in these forms of literature. Method, rapid reading with attention directed to a few qualities, rather than minute detailed study. To give a broader outlook the reading done by the student will be supplemented by reports and lectures. Two hours credit.

14. Literature. Elective second semester Junior or Senior year in all Engineering courses. A continuation of course 13, with emphasis on the Essay, the Drama, and Lyric Poetry. All work will be assigne with a view to appreciation through rapid reading, rather than by minut study. In the Drama will be included one or more plays from Shakespeare and also from present day dramatists. In the Essay, selection from such masters as Ruskin, Emerson, and Carlyle. In Lyric Poetry selections from the most prominent poets of the 19th century. Two hour credit.

DEPARTMENT OF PUBLIC SPEAKING.

ADRIAN M. NEWENS, PROFESSOR.
SYBIL M. LENTNER AND FREDRICA V. SHATTUCK, INSTRUCTORS.
WINIFRED R. TILDEN, INSTRUCTOR IN PHYSICAL CULTURE.

The relation of the work of this department to the college course is the same as that of any other study. In some courses Public Speaking is elective, in some, it is required; the credits are given on a basis with every other required or elective study. We aim to equip men and women to speak well, to tell what they know and give their opinions, to read and recite in a pleasing and effective manner. All will be called upon at some time to speak publicly, all talk every day, more or less, and for both the more formidable speech and for conversation the work of the department is planned. The subjects which make for perfection along these lines are briefly; emphasis, enunciation, articulation, time, energy, inflection, appreciation of literature, voice culture, gesture, vocabularly, etc., etc.

Public Speaking has been and still is considered often as a special, peculiar and extraordinary art. There is no denying that it is an art, but first of all it is common sense; common sense applied to speech. The principles which govern conversation to make it dignified, pleasing and forceful may be called Elocution. The mastery of them would make the speaker artistic. These principles are not different when applied to public speech. Public speech is, therefore, conversation on an enlarged scale.

To reduce Public Speaking to a system is neither possible nor desirable. No one system can be made applicable to all persons, as no one style of clothing is appropriate to all classes and conditions of men. There are as many styles of elocution or systems of expression as there are people. Each one possesses an elocution of his own and that should not be taken from him and an inferior one for him be substituted. The development of that power and manner which one possesses already is our aim in the courses of study outlined below.

We grant that all so-called systems have good suggestions. We attempt to use the best of any and all methods, but the student himself is the system and he and his possibilities should be respected. The elimination of faults in speech which mar his efforts, and the correction of mannerisms that hinder his success are subjects of adverse criticism. To stand and think and talk well at one and the same time should be the ambition of every student, man or woman, in his chosen occupation.

ie theory and practice of Expression,—and speech is more practice
an theory,—covers four years of work to those who begin in the Acade-
c year, three years to those who begin as Freshman. However, not
the college courses grant electives in this department with credit,
ough none are excluded if the proper consent is given.

Special Announcement of Courses in Extempore Speech.

The courses in Extempore Speech are designed to give students prac-
al training in speaking without notes or without having written and
mmitted to memory a formal address. There is a great demand for
en, who are well versed in the sciences and industries as offered in the
veral departments of the College, to address institutes, conventions,
ıbs and commissions on topics related to their chosen work. At gath-
ings formal and informal that person is in demand who can say the
ght thing at the right time and in the right way. It is a worthy accom-
ishment to be able to speak well upon any occasion. For all such these
urses aim to prepare the student. They are in every way practical.
he student from the very first is called to the floor to address his class
assigned topics. He is given from three days to a week to gather his
aterial and get it ready for his appearance before the class. As often
once a week each individual is on the floor, oftener if possible. He
subjected to criticisms by the class and the instructor. Criticisms are
fered on the prescribed lines of general appearance, force of address,
rangement of material, use of words, vocabulary, etc., etc. By subject-
g himself to this severe scrutiny, and by the frequency of his ad-
esses, the student gains an acquaintance with himself and a habit of
inking on his feet, which is real experience in speechmaking, second only
that which he would gain in appearing before outside audiences.

COURSES IN PUBLIC SPEAKING.

2. **The Declamation.** Required the first semester of the Acade-
ic year in all Agricultural courses and elective in the second semester
the Sophomore year in General Science course. This course is plan-
ed to help the student get command of himself. Attention is especially
ven to voice building and bodily expression. Besides this technical
ork, students are assigned individual selection for practice and each is
et for private rehearsal at regular intervals. One hour per week.

3. **Interpretation.** Elective the first semester of the Junior or
enior year in all Agricultural and Science courses. This is a course
the study of methods of vocal interpretation, methods of criticism
ıd methods of delivery. Of each student is required a repertoire, and
side the class lectures and class exercises on topics pertaining to inter-
etation, each student is instructed privately and personally at stated
tervals throughout the semester. Prerequisite, Course 2 or its equiv-
ent. Two hours per week.

4. Interpretative Analysis. Elective second semester Junior or Se
ior year of all Agricultural and Science courses. This course is a continu
tion of Course 3. Character study, dramatic and analytical interpretati
are begun. Methods of analyzing, clipping and arranging stories and oth
literary forms complete the term's work. Students are met for priva
rehearsals and criticisms as in preceding courses. In this course cla
and public recitals are expected of the students. Prerequisites, Cours
2 and 3 or students may be admitted to this course upon the recomme
dation of the instructor in charge. Two hours credit.

5. The Lecture Recital. Elective the first semester of the Juni
or Senior year in all Agricultural and Science courses. Option betwe
courses 5 and 10. It is a close study of dramatic recitations of all sor
of the monologue, of the play and of the lecture-recital. Instruction
given by lectures and each student prepares one long and strong pr
gram, either a monologue or a lecture-recital, for the semester. Pr
requisites, Courses 2 and 3. Two hours credit.

6. The Monologue. Elective the second semester of the Juni
or Senior year in all Agricultural and Science courses. Option betwe
6 and 11. This course is a continuation of Course 5. Advanced dr
matics, plays and lecture-recitals are studied and prepared. Prerequisite
Courses 2, 3, 4 or 5. Two hours credit.

7. The Fine Art of Speech. Elective the first semester of t
Junior or Senior years in Science courses. This is a course f
women in the fine art of the spoken word. Though covering much t
same ground as Course 10, it is designed particularly to suit the nee
of women. The art of speech is compared with other arts; spee
forms and values are studied and much time is given to extempo
speech making in class. Two hours credit.

8. Orations and Orators. Required the second semester of t
Junior year in the General Science course and elective Junior or Seni
year in all Agricultural courses. This course is a study of prepared a
formal addresses such as orations and speeches for special occasio
Historical masterpieces and winning orations are studied, lectures a
given on the technical structure of oratorical productions. At least o
oration is required of each student during the semester. One hour cred

9. Oration. Required the first semester of the Senior year i
the General Science course. Optional with course 10. One oration
written under the personal direction of the head of the department. O
hour credit.

10. Extempore Speech. Elective the first semester of the Juni
or Senior year in all Agricultural courses and the Science course. O
tional with course 9 in the first semester of the senior year Science cours
The purpose of this course is to develop the power of extemporaneo
speaking. Following a course of eight lectures relating to the fund
mental principles of speech, the student begins his own practical wo
of extemporization. During this semester the principles of Argume
tation are studied, and the assigned topics which the students develop

eir speeches are argumentative in nature. Each member of the class supposed to deliver from eight to fourteen extemporaneous addresses ring the term, which gives him some considerable practice in practical eech-making. Open to Juniors and Seniors only. No prerequisite urse. Two hours credit.

11. **Extempore Speech.** Elective the second semester of the nior or Senior year in all Agricultural courses and the Science course. iis course is a continuation of course 10; the same methods are pursued a more careful study of Exposition, Description and Narration. After ese three literary forms are studied we review the Argumentative form. ie year's work is closed by requiring of each student, instead of an amination, a lecture of considerable length on an assigned topic. These o courses, 10 and 11, are made as practical as time and methods will mit. There is no course absolutely prerequisite to course 11, although is desirable to have the student elect course 10 in the first semester. vo hours credit.

NOTE—Engineering students may elect any of the courses in public speaking by first tting the consent of the Dean of Engineering.

15. **D. E. Extempore Speech.** Required the first semester of the nior year in the Domestic Economy course. This course is for women ly, and is designed to prepare them for extemporaneous demonstration ork, and all sorts of speechmaking before their classes, women's clubs, stitutes, and other organizations before whom women are asked to apar in the discussion of some topic of vital interest to the assembly. ie purpose of the course is not different from the purpose of courses and 11. We intend in this course to help women to stand and think d talk well before any audience without manuscript or notes; neither e the addresses written and committed to memory. No prerequisite urse. Two hours credit.

Special Work in Public Speaking.

Besides these specified courses of instruction in class, numerous ecial lessons and drills are given in the nature of coaching. Special lections are assigned based on the needs of the student as seen in his ass-room work and his defects and strengths are given special attention. iterary society declamatory and oratorical contest work is cared for by e teaching force of the department, such drill and preparation as each ay need for his appearance in the contest are provided *gratis.*

PHYSICAL CULTURE FOR WOMEN.

Training in Physical Culture is required of the young women throughıt the Freshman and Sophomore years. The work is given in two orty-five minute periods each week.

Before admission to the gymnasium classes, each student must be camined by the director with reference to physical development, strength f heart and lungs, and hereditary tendencies. These examinations with measurements are given at the beginning and close of each year's worl No student will be excused from the regular exercises except by ord of the college physician.

The Swedish System of gymnastics, including marching tactics, cali thenics, and apparatus work, is taught. The highest ideals are kept co stantly before the mind, not only health and strength, but ease, grace an refinement in manner and carriage of the body.

Facilities for basket-ball, tennis and field hockey are provided an tramping squads are arranged for those who prefer this form of exercis During the first six weeks in the Fall and the last six weeks in the Sprin the physical training will be out of doors and each student may choos which of the above mentioned sports she prefers. The regular gymnasiu work begins the middle of October and continues until the middle o April.

Gymnasium suits of dark blue serge or flannel, regulation blous and bloomers, and gymnasium shoes are required.

COURSES IN PHYSICAL CULTURE.

1. **Marching Tactics.** Required the first semester of the Fresh man year, of all young women in College. Exercises for correct standin walking and breathing, marching tactics, figure marching. First ter wands and games. Two hours per week. Fee, $1.00.

2. **Calisthenics.** Required second semester of the Freshma year of all young women in College. Calisthenics, marching tactic Second term wands and dumb bells. Two hours per week. Fee, $1.00.

3. **Light Apparatus.** Required first semester of the Sophomor year of all young women in College. Second term, dumb bells and India clubs. Light apparatus work. Two hours per week. Fee, $1.00.

4. **Swedish Gymnastics.** Required second semester of the Soph omore year of all young women in College. Bar bells, apparatus wor stall bars, ladders, rings, etc. Fee, $1.00.

DEPARTMENT OF MODERN LANGUAGES.

LIZZIE MAY ALLIS, PROFESSOR.
MISS NORTON, MISS LUCAS, MISS MC COLLOM, MISS PETERS, MISS LOMME
AND MISS HOPPER, INSTRUCTORS.

The College now offers a three years' course in French, German an Spanish.

COURSES IN MODERN LANGUAGES.

French.

1. **French.** Required first semester Academic year in all Agricultural, Engineering and Science Courses of those students who d

t take German or Spanish, and elective first semester Junior or Senior ar in all Agricultural and Science courses. Fraser and Squair's French rammar, Conversation and Dictation. Five hours credit.

2. French. Required second semester Academic year in all Ag-cultural, Engineering and Science courses for those students who do t take German or Spanish, elective second semester in Junior or Senior ar in all Agricultural and Science courses.

Grammar continued. "Sans Famille," Malot. François French Prose omposition. Conversation and Dictation. Thorough course in irregular rbs. Prerequisite, Course 1. Five hours credit.

3. French. Required first semester Freshman year in Science urses, elective first semester Junior or Senior year in all Agricultural d Science courses. Option between this, Course 7 and Course 32.

"Mon Oncle et Mon Cure," La Brète; "La Chute," Hugo. Prose omposition, Conversation and Dictation. Prerequisite, Course 2. Five ours credit.

18. French. Required first semester Freshman year in all four ar Engineering courses. Option between this, Course 20 and Course 5. Composition work and Scientific French. Prerequisite, Course 2. hree hours credit.

19. French. Required second semester Freshman year in all ur year Engineering courses. Option between this, Course 21 and ourse 37. Composition work and Scientific French. Prerequisite, ourse 18. Three hours credit.

50. French. Required second semester Freshman year in Sci-nce courses, elective second semester Junior or Senior year in all Agri-ltural and Science courses. Option between this, Course 26, and Course 3. Tales of Maupassant and Zola. "Le Chevalier de Maison-Range," umas. Composition, Dictation and Conversation. Prerequisite, Course . Three hours per week.

51. French. Required first semester Sophomore year in Science ourses. Option between this, Course 27, and Course 39. "La Belle ivernaise," Daudet, "Le Bourgeois Gentilhomme," Moliere; "Atalie," acine. Prerequisite, Course 50. Three hours credit.

52. French. Required second semester Sophomore year in Sci-nce courses. Option between this, Course 28, and Course 40. Selections rom the French Poets. Composition, Conversation. Prerequisite, Course 1. Three hours per week.

54. French. Required second semester Freshman year in Gen-ral Science course. Option between this, Course 72, and Course 44. La Mare and Diable," George Sand. French Composition, Conversation, ictation. Prerequisite, Course 1. Three hours credit.

55. French. Required first semester Sophomore year in General cience course. Option between this, Course 71, and Course 43. French iterature or Scientific French. Prerequisite, Course 54. Three hours er week.

56. French. Required second semester Sophomore year in General Science course. Option between this, Course 72, and Course 4 French Literature or Scientific French. Prerequisite, Course 55. Thre hours per week.

57. French. Required first semester Freshman in Engineerin Courses of those students who have presented for admission four credit in Latin. Three hours credit.

58. French. Required second semester Freshman year in Engineering courses of those students who have presented for admission fou credits in Latin. Three hours credit.

German.

5. German. Required first semester Academic year in all Agricultural, Engineering and Science courses, elective first semester Junio or Senior year in all Agricultural and Science courses. Option betwee this, Course 1, and Course 30. "German Lesson Grammar," Joynes an Wesselhoeft. Grammar composition, reading and conversation. Fiv hours credit.

6. German. Required second semester Academic year in all Agricultural, Engineering and Science, elective second semester in Junior o Senior year in all Agricultural and Science courses. Option between thi Course 2, and Course 31. Continued drill in the principles of declensio conjugation and syntax. "German Lesson Grammar," Joynes and Wesselhoeft. "Immensee," Storms. Prerequisite, Course 5. Five hours credi

7. German. Required first semester Freshman year in Scienc courses, elective first semester Junior or Senior year in all Agricultura and Science courses. Option between this, Course 3, and Course 3 "Höher als die Kirche," Hillern, and "Willkommen in Deutschland, Mosher. Prerequisite, Course 6. Five hours per week.

20. German. Required first semester Freshman year in all fou year Engineering courses. Option between this, Course 18, and Cours 36. German prose, narrative. Prerequisite, Course 6. Three hours credi

21. German. Required second semester Freshman year in a four year Engineering courses. Option between this, Course 19, an Course 37. "Scientific German," Blochman. Prerequisite, Course 2 Three hours per week.

26. German. Required second semester Freshman year in Science courses, elective second semester Junior or Senior year in all Agr cultural and Science courses. Option between this, Course 50, and Cours 38. "Wilhelm Tell," Schiller. Conversation and study of Syntax. Prerequisite, Course 7. Three hours per week.

27. German. Required first semester Sophomore year in Scienc courses. Option between this, Course 51, and Course 39. "Maria Stuart Schiller. "Elements of German Conversation," Vos. Prerequisite, Cours 26. Three hours per week.

28. German. Required second semester Sophomore year in Science courses. Otpion between this, Course 52, and Course 40. "Natha

r Weise," Lessing, or "Hermann und Dorothea," Goethe. Prerequisite,
urse 27. Three hours per week.

29. German. Required second semester Freshman year in Gen-
al Science course. Option between this, Course 54, and Course 42.
rman Literature or Scientific German. Prerequisite, Course 5. Three
urs per week.

71. German. Required first semester Sophomore year in Gen-
al Science course. Option between this, Course 55, and Course 43.
rman Literature, Scientific German. Prerequisite, Course 29. Three
urs per week.

72. German. Required second semester Sophomore year in Gen-
al Science course. Option between this, Course 56, and Course 44.
rman Literature, Scientific German. Prerequisite, Course 71. Three
urs per week.

73. German. Required first semester Freshman in Engineering
urses, of those students who have presented for admission four credits
Latin. Three hours credit.

74. German. Required second semester Freshman of those stu-
nts who have presented for admission four credits in Latin. Three
urs credit.

Spanish.

30. Spanish. Required first semester Academic year in Agricul-
ral, Engineering and Science courses, elective first semester Junior or
nior year in all Agricultural and Science courses. Option between this,
urse 1, and Course 5. "First Spanish Book and Reader," Giese.
letodo Berlitz," Exercise, Dictation, Conversation. Five hours per
eek.

31. Spanish. Required second semester Academic year in Agri-
ltural, Engineering and Science, elective second semester in Junior
Senior year in all Agricultural and Science courses. Option between
is, Course 2, and Course 6. Giese's Reader and "Metodo Berlitz,"
ntinued. Prerequisite, Course 30. Five hours per week.

32. Spanish. Required first semester Freshman year in Science
urses, elective first semester Junior or Senior year in all Agricultural
d Science courses. Option between this, Course 3, and Course 7.
larcon's "El Capitan Veneno." Review of Grammar with Exercises.
erequisite, Course 31. Five hours per week.

36. Spanish. Required first semester Freshman year in all four
ar Engineering courses. Option between this, Course 18, and Course
. "Zaragüeta," Carrion and Aza; "Introduccion al Estudio de las
encias," from "Cartillas Cientificas." Prerequisite, Course 31. Three
urs per week.

37. Spanish. Required second semester Freshman year in all
ur year Engineering courses. Option between this, Course 19, and
ourse 21. Books selected from "Cartillas Cientificas." Prerequisite,
ourse 36. Three hours per week.

38. Spanish. Required second semester Freshman year in Science courses, elective second semester, Junior or Senior year, in all Agricultural and Science courses. Option between this, Course 50, and Course 26. "Dona Perfecta," Galedos. Prerequisite, Course 32. Three hours per week.

39. Spanish. Required first semester Sophomore year in Science courses. Option between this, Course 51, and Course 27. "Pedro Simchez," Pereda. Prerequisite, Course 38. Three hours per week.

40. Spanish. Required second semester Sophomore year in Science courses. Option between this, Course 52, and Course 28. "El Comendador Mendoza," Valera. Prerequisite, Course 39. Three hours credit.

42. Spanish. Required second semester Freshman year in General Science course. Option between this, Course 54, and Course 29. Spanish Literature or Scientific Spanish. Prerequisite, Course 30. Three hours per week.

43. Spanish. Required first semester Sophomore year in General Science Course. Option between this, Course 55, and Course 71. Spanish Literature or Scientific Spanish. Prerequisite, Course 42. Three hours per week.

44. Spanish. Required second semester Sophomore year in General Science course. Option between this, Course 56, and Course 72. Spanish Literature or Scientific Spanish. Prerequisite, Course 43. Three hours per week.

45. Spanish. Required first semester Freshman in Engineering courses of those students who have presented for admission four credits in Latin. Three hours credit.

46. Spanish. Required second semester Freshman in Engineering courses of those students who have presented for admission four credits in Latin. Three hours credit.

DEPARTMENT OF HISTORY.

ORANGE HOWARD CESSNA, PROFESSOR.
LOUIS BERNARD SCHMIDT, ASSISTANT PROFESSOR.
ETHYL CESSNA AND MAUDE AGETON, INSTRUCTORS.

COURSES IN HISTORY.

1. English History. Required for entrance to all Academic courses unless satisfactory credits are presented. This course treats of the political, constitutional, religious, social and economic features in the development of Great Britain. Special attention is given to those influences which have effected American history. Text-book, library and written work. Prerequisite, one year of general history. Five hours credit.

2. **Advanced American History.** Required the second semester Academic year in all Science courses. Presupposing an outline knowl- dge of European and American history, this course aims to give a aturer and more comprehensive view of American development. It rresponds to the American history offered in last year in accredited gh schools. Text-books, lectures and assignments. Four hours per eek.

3. **The West in American History.** Elective first semester of the unior or Senior years in all Science and Agricultural courses. This urse treats of the history of the settlement and development of the west, ith special reference to the Mississippi Valley. Emphasis is put on cial, economic and political conditions. It deals with the westward ovements, the growth of new institutions, the bearing of new problems pon the interpretation of the constitution and economic and social forces their influence upon the growth of democracy. Text-book, lectures d research work. Three hours per week.

4. **Division and Reunion, 1850 to 1876.** Elective the second se- ester of Junior or Senior year in all Agricultural and Science courses. onditions preceding the Civil War, the causes, principal features and sults of the struggle; the Reconstruction period; the political, social, nd economic movements and foreign relations of America as it faces e problems of the present. Text-book, lecture and research work. hree hours per week.

5. **Europe in the XVIth, XVIIth and XVIIIth Centuries.** Re- uired second semester Freshman in General Science Course, elective econd semester Junior in Agricultural courses. A study of historical evelopment, the Reformation, struggle for constitutional liberty in Eng- nd, ascendency of France, rise of Prussia and Russia, England's olonial supremacy, also social, economic and literary questions. Lec- ures and library work. Three hours per week.

6. **French Revolution and XIXth Century.** Required as an op- onal with Economics 10, in the second semester Sophomore year in orticulture and Forestry and Dairying courses. Elective in the first emester of Sophomore year in the General Science course, elective in ll Agricultural courses. Causes and results of the French Revolution, he Napoleonic era, reactions and revolutions of the XIXth Century to he close of the Franco-Prussian war; also institutional changes touch- ng the political, social and economic aspects of the movement. Text- ooks, library, and lecture work. Three hours per week.

7. **America in the Far East.** Elective in the first semester of the unior or Senior year in Engineering courses. This course is a study f some of the later phases of American development, especially as it as come into touch with the Far East. Lectures and library work. wo hours per week.

9. **Some Later Phases of the Far Eastern Question.** Elective econd semester of the Junior or Senior years in the Engineering, Agri- ultural and Science courses. This course is a study of some of the

later developments in the Far East, dealing especially with the New China and the New Japan since the Russo-Japanese War, showing America's new interest in the Far East. Lectures and library work. Two hours per week.

10. The Renaissance. Elective first semester of either the Junior or Senior years in all Science and Agricultural courses. A general survey of the renaissance period followed by a somewhat detailed exposition of economic, political, intellectual and artistic progress with a criticism of the importance attached to the influence of revived antiquity. Includes a history of the movement in Italy and in the northern countries, and a consideration of the agencies and events which ushered in the modern age. Text-books, lectures and assignments. Two hours per week.

11. Constitutional History of England. Elective second semester Junior or Senior year in Science and Agricultural courses. Study of origin and development of the English constitution and political institutions, and their influence upon the American political system. Text-book, lectures and examination of documents. Recitations, two hours per week.

12. Diplomatic History of the United States, 1775-1829. Elective first semester of either the Junior or Senior years in the Science and Agricultural courses. A study of the diplomatic negotiations and treaties between the United States and foreign powers. Special attention will be given to the formation of the French alliance, treaty of 1783, early commercial treaties, complications arising out of the Napoleonic wars, purchase of Louisiana, Barbary powers, Treaty of Ghent, acquisition of the Floridas, the Monroe Doctrine and the Panama Congress. The progress of international law so far as it has been affected by the United States in these controversies will also be considered. Text-book, lectures and library work. Two hours per week.

16. The National Period. Required second semester in the Academic year of all Agricultural and Engineering courses. Presupposing an outline knowledge of European and American history, this course aims to give a maturer and more comprehensive view of American development from 1789 to the present. Text-book, lectures and assignments. Three hours credit.

17. The American People. Required in the first semester of either the Sophomore or Junior year in all Engineering courses. This course gives an outline view of the expansion of the American people. Special emphasis is given to the social and territorial features in this development, with special reference to the part played by the people in the making of the American nation. Lecture, text-book and library work. One hour per week.

18. American Statesmen. Required second semester of either the Sophomore or Junior year in all Engineering courses. This course treats of the work of the leading statesmen in the formation and growth of the American nation. The different movements in the political evolution of a nation become embodied in great men. While emphasis is placed on movements rather than on biographical details, yet it is recognized that these movements become vitally expressed in personality. Lecture, text-book and library work. One hour per week.

19. The Making of the Nation, 1783-1817. Required the first semester of the Freshmen year in all Agricultural courses. This course treats of the formation of the American Union. It includes a preliminary survey of the Revolutionary period; a study of the critical period; the formation and adoption of the constitution; the inauguration of the new government; early national problems, and the formation of policies and political parties. Lectures, text-books and library work. Two hours a week.

20. History of Education. Elective in both semesters of the Junior or Senior years of all Science and Agricultural courses. This course aims to give a comprehensive view of the history of education during the Ancient, Mediaeval and Modern Periods. It will be based on approved texts supplemented by lectures and library work. Two hours per week.

DEPARTMENT OF CIVICS.

RICHARD CORNELIUS BARRETT, PROFESSOR.

Civics as herein used means the science that treats of citizenship and of the relations between citizens and the government; ethics, or the doctrines of duty to society; civil policy, or governmental methods and machinery; law, in its application most directly involving the interests of society; history of civic development and movement, and the structure and working of the government and the interrelation of states.

While it is planned to give instruction concerning the American government as it now exists, the student will be expected to look forward to the solution of such problems as may confront the people and the government. At the same time such definite and fixed historical information will be expected from each student as will enable him to have a clear understanding of present governmental forms and practices.

No system of human government is perfect. The discussion of defective laws and the non-enforcement of present laws are common topics of conversation in every state.

Believing that in a republic where the people are supreme, an education is incomplete, if not a failure, that does not relate itself to the duties and opportunities of citizenship it will be a purpose to point out to the student a reasonable and patriotic duty touching present laws, and to aid him in all possible ways to become a useful, honored, and law abiding member of the civic community, and to give him suitable instruction with regard to public affairs.

The courses are planned to give such knowledge and training as it is believed should be a part of a liberal education.

The courses offered in Civics are more or less closely interrelated with those given in the Departments of History, and Economic Science, but it is believed that the association will prove in every way helpful to the student.

COURSES IN CIVICS.

1. **Government in State and Nation.** Required first semester Academic in all Engineering courses. Includes study of city, county, and state governments; constitutional conventions; constitutions as "Supreme Law;" checks and balances; the presidency, senate, and house of representatives; general powers of congress; judicial system, federal and state; division of power; comparison with other federal governments; spoils system and civil service; and government of territories and colonies. Text-book, supplemented by papers and library work. Recitations, two hours per week.

2. **Principles of American Government.** Elective first semester Junior or Senior year in all Science courses. Includes study of Magna Charta, Act of Habeas Corpus, Petition of Rights, Bill of Rights, Declaration of Independence, Articles of Confederation, First State Constitutions, Constitution of the United States, American Party System, and relation between Federal and State Governments. Prerequisite, Course 1 or its equivalent. Individual investigations and library work. Recitations, three hours per week.

3. **State and Federal Constitutions.** Elective second semester Junior or Senior year in all Science courses. Includes study of the rise of American Union; distribution of powers of government; the powers of Congress, the legislature, and federal and state executive; the judicial department of state and federal government; government of the territories; admission of new states; civil rights and their guaranties; political privileges and their protections; protection of persons accused of crime; contract and property; eminent domain; and municipal corporations. Prerequisite, Course 2. Text-book supplemented by lectures, papers and library work. Recitations, three hours per week.

4. **Citizenship.** Elective second semester Junior or Senior year in all Science courses. Includes study of the family and its government; conditions of good citizenship; rights and duties of citizens; citizen's duty to government; abuses and perils of government; improvement of government; economic duties of citizens; social rights and duties; great social subjects; treatment of criminals, paupers and incorrigible children; international duties, or the rights and duties of nations; ideals, or the higher law. Prerequisites, Courses 2 and 3. Recitations, two hours per week.

5. **Rural Law.** Elective second semester Junior or Senior year in all Agricultural courses. A study of Iowa laws as related to highways, fences, weeds, water rights, ditching, drainage, live stock, trespassing; also the legal rights, duties and responsibilities of farmers;

also contracts, negotiable instruments, sales and personal property. Recitation, one hour per week.

6. **Actual Government.** Elective second semester, Sophomore year in Science course. A study of governmental systems, including state government and various phases of local government; the Constitution and Statutes as framework of the government and as dependent upon personal interest and action; also working experience of constitution and laws. Considerable attention is given to current events. A more extended course than 9 covering more completely both the organization and functions of government. Recitations, three hours per week.

7. **Comparative Government.** Elective first or second semester Junior or Senior year in all Engineering courses. A comparative study of the governments of England, France, Germany, Switzerland, Canada, Mexico and the United States. Also principles of constitutional and international law. Recitations, lectures or papers, two hours per week.

8. **Government in State and Nation.** Required in first semester Academic course in all Science courses. Includes study of city, county, and state governments; exercise of police power, and penal and charitable institutions; constitutional conventions; constitutions as "Supreme Law;" checks and balances; the Presidency, Senate and House of Representatives; general powers of Congress; judicial system, federal and state; division of power; comparison with other federal governments; spoils system and civil service; and government of territories and colonies. A more extended and thorough course than 1. Text-book supplemented by papers and library work. Recitations, three hours per week. The 1908-9 students will pursue Course 2.

9. **Actual Government.** Elective first semester in either Freshman, Sophomore, Junior or Senior year, in Domestic Economy course. A study of governmental systems, including state government and various phases of local government; the Constitution and Statutes as framework of the government and as dependent upon personal interest and action; also working experience of constitution and laws. Considerable attention is given to current events. Recitations, two hours per week.

DEPARTMENT OF MILITARY SCIENCE AND TACTICS.

JAMES RUSH LINCOLN, PROFESSOR.

It is not intended to complete the education of the thorough soldier, but to fit young men for filling intelligently, positions in the State troops as line officers and company instructors. The constant demand for men thus trained emphasizes the value of a thoroughly organized and well sustained military course. The chief advantages derived are the acquirement of a dignified carriage of person, a gentlemanly deportment and a self respecting discipline, with habits of neatness, order and punctuality. Opportunities are afforded each cadet for extending the studies in military science, as desired, the College being provided with the necessary arms, accoutrements and outfits for drill and instructions in the infantry, artillery, and signal tactics, for which special classes will be formed. Lectures on military subjects are delivered throughout the course and regular battalion drill and parade take place each Monday and Wednesday afternoon.

All male students of the Freshman and Sophomore years, except such as may be excused on account of physical disability by proper authority, are required to become members of the College Battalion, and wear the prescribed military uniform during military exercises.

COURSES IN MILITARY SCIENCE AND TACTICS.

1. **Required** first semester Freshman year in Agricultural, Veterinary, Engineering and Science courses. Two drills per week.

2. **Required** second semester Freshman year in Agricultural, Veterinary, Engineering and Science courses. Two drills per week.

3. **Required** first semester Sophomore year in Agriculture, Veterinary, Engineering and Science courses unless regularly classified in Physical Training. Two drills per week, also the Non-Commissioned Officers' School of one hour per week, the School of the Guides and Guard Duty, required of all officers.

4. **Required** second semester Sophomore year in Agriculture, Veterinary, Engineering and Science courses unless regularly classified in Physical Training. Two drills per week, also the Non-Commissioned Officers' School of one hour per week. Drill regulations and Guard Duty, required of all officers.

5. **Elective** first semester Junior year in Veterinary, Engineering and Science courses and first semester Junior or Senior year in all Agricultural courses. Two drills and Officers' School of one hour per week; Drill Regulations, Guard Duty, and Army Regulations.

6. **Elective** second semester Junior year in Veterinary, Engineering and Science courses and second semester Junior or Senior year in all Agricultural courses. Continuation of Course 5.

7. **Elective** first semester Senior year in Veterinary, Engineering and Science courses and first semester Junior or Senior year in all Agricultural courses. Two drills and Officers' School of one hour per week; Service of security and information, Military Engineering, Military Law and Military Hygiene.

8. **Elective** second semester Senior year in Veterinary, Engineering and Science courses and elective second semester Junior or Senior year in all Agricultural courses. Continuation of Course 7.

THE LIBRARY.

VINA ELETHE CLARK, LIBRARIAN.
(Granted one year's absence).
CAROLYN GRIMSBY, ACTING LIBRARIAN.
MARGARET FORGEUS, CATALOGUER.
EMMA LEONARD, ASSISTANT LIBRARIAN.
MRS. ELEANOR HOLLOWAY, ASSISTANT LIBRARIAN.
CAROLINE E. LAIRD, ASSISTANT LIBRARIAN IN CHARGE OF ENGINEERING LIBRARY.
J. F. BOOTH, STUDENT ASSISTANT IN ENGINEERING LIBRARY.
S. W. ALLEN, STUDENT ASSISTANT IN GENERAL LIBRARY.

The College Library, consisting of over 23,000 volumes and 6,000 pamphlets, is chiefly a library of reference containing standard and technical works bearing particularly upon the lines of work pursued in the College. These include standard works of history, biography, engineering, agriculture, natural sciences, mental and moral philosophy, poetry, general literature and reference. The books are selected with great care, the heads of the departments indicating such works as they wish the library to have bearing upon their respective lines of work.

This year the College received by bequest about 1,500 volumes pertaining to Engineering and Economics from the library of the late Geo. W. Catt. This Engineering Library with that section of books from the general collection has been made a Departmental Library located in Engineering Hall.

The library is classified according to the Dewey Decimal System of Classification and the card catalogue is in two parts, the Dictionary (author and title) and Classed.

The library has on file 6,000 unbound pamphlets, and is in constant receipt of large numbers of publications from the various departments of the government, agricultural experiment stations and other sources. The library has also several hundred bound volumes of government publications, such as Geological Surveys, United States Experiment Station Bulletins, Congressional Record, Census Reports and Cabinet Officers' Reports.

The library receives about 250 periodical publications, literary, scientific and general, and there are complete files of many of these upon the shelves.

The library subscribes for several dailies and, through the courtesy of the editors, a large number of the daily and country newspapers of Iowa are sent to the reading room for the use of students.

The reading room of the library is open to readers thirteen hours daily, except Sundays, when it is open four hours. Current numbers of periodicals are kept in the reading room and are accessible to all, as are newspapers, college exchanges, dictionaries, encyclopaedias, Poole's Index, the card catalogue, etc.

Personal assistance and suggestions upon all matters relating to the library will be given by the librarian and assistants to all who desire such help.

COURSE IN LIBRARY WORK.

1. Library Work. Required first semester Freshman year in Agronomy, Dairy, Animal Husbandry, Horticultural, Science and Agriculture and General Science courses. Four hours per semester.

DEPARTMENT OF MUSIC.

FACULTY

ALBERT BOYNTON STORMS, A. M., D. D., L. L. D.
President.

ALEXANDER STEWART THOMPSON,
Director.
Piano, Pipe Organ, Voice and Theory.

CLARA DUTTON THOMPSON,
Vice Director.
Voice, Preparatory Piano and Organ

HERBERT L. HOUSTON,
Violin and Stringed Instruments.

CHARLES L. MUNDHENK,
Brass Instruments.

Ames Conservatory of Music was established as a department of the College. It is essentially a school of musical learning. It stands for high ideals and strives by means of thorough training to develop to the highest stage of artistic capability all those possessing musical talent.

No Requirements Necessary for Admission.

As the work in the Conservatory is largely private instruction, there are no special requirements for admission, but it is always desirable to bring a musical selection well prepared to perform before the Director, or before the teacher at the first lesson. In this way only can a satisfactory opinion be formed as to the student's ability, grade of advancement, or character of the previous study.

All grades of instruction are given from the very beginning to the most advanced ideas in interpretation.

Complete Courses

In Pianoforte, Pipe Organ, Voice, Harmony, Counterpoint, Canon, Fugue, Analytical Harmony and Form, Composition and Musical History.

Other Courses Offered.

Ensemble Music, Sight Reading, Chorus Singing, Choir and Band Practice.

Free Privileges.

All of the recitals by students and the recitals and lectures given by the instructors are free to all of the music students, also practice in the college choir. The music students in common with all of the college students have many opportunities of hearing distinguished speakers on the college platform, which opportunities conduce largely to the mental culture and development of the earnest student. A large state institution like Iowa State College offers much more advantage in the hearing of great speakers than the smaller institutions.

The Literary Societies of the College are open to students of the Conservatory.

Artists' Course.

From time to time great musical artists will be heard at the College. For these entertainments a charge will be made, and all musical students are expected to attend.

Choral Society Concerts.

At least two concerts will be given during the year by the Choral Society on which occasions the Society will be assisted by celebrated musical artists from abroad.

Such works as Barnby's Rebekah, Gaul's Holy City, Buck's Forty-Sixth Psalm, Coleridge Taylor's Hiawatha's Wedding Feast, Cowen's Rose Maiden, A. S. Thompson's Lazarus have been successfully given in concert. Such artists as Madame Isabelle Bouton of New York have sung with the Choral Society.

An excellent Male Glee Club gives concerts each semester. Membership in this organization is gained by examination.

Requirements for Graduation.

The candidate for a certificate from the College for the completion of any course in music shall possess an English education equivalent to admittance to the Freshman year of the College in the Science courses.

Diplomas will be awarded pupils who have completed the prescribed course, which in all specialties whether piano, voice or organ, includes the thorough study of harmony and musical theory and a knowledge of musical history. No diplomas will be issued excepting under above conditions, but students who are unable to remain long enough to complete the full course will be given a certificate on conditions outlined below.

The granting of an Artist's Diploma is partially dependent upon the ability to render compositions in a finished and artistic manner. Quality of performance is a decisive factor in the award of this diploma.

Those who wish to enter upon a regular course leading to graduation should make application to the Director after finishing the second term in Harmony.

Vocal Music.

Candidates for the teacher's certificate in vocal music, in addition to the above general requirements, must have satisfactorily completed the three years' course in vocal music and must possess the ability to perform acceptably selections from the standard oratorios and operas. They must also have completed one year each of the modern languages—French and German, one year of Sight Singing, and two years of Harmony.

Candidates for the artist's diploma must have completed the four years' course in vocal music, besides the general requirements, which include a two year's course in Harmony, and one year of Sight Singing.

Piano.

Candidates for the teacher's certificate in piano, in addition to the general requirements, must have satisfactorily completed the three year course outlined below, including compositions covering the classical and romantic periods and also the lighter works of some modern composers. They must also have satisfactorily completed the course in musical history, in ensemble playing, and the full theoretical course.

Candidates for the artist's diploma in piano, in addition to the work required for a teacher's certificate, must have completed the four years' course in piano. Particular emphasis is placed upon the graduation recital for students in the piano course.

Pipe Organ.

Candidates for graduation in this course must have completed the prescribed work on organ, the course in musical history, the full theoretical course and be able to accompany a choir, chorus of soloists in a satisfactory manner.

COURSES OF STUDY.

THEORY.

Harmony. Four Terms.

Text-book—Goetschius, The Material used in Musical Composition.

Keys, scales and signatures; intervals, the triads, chord connection, simple part writing and keyboard work.

Harmonizing basses, inversions, chords of the sixth, keyboard work and ear training.

Chords of the seventh and their inversions. Modulation begun.

Chords of the seventh and their inversions continued.

Chords of the ninth. Altered and augmented chords.

Suspensions, Retardations and Organ Point.

The harmonization of melodies begun. Modulation continued and completed.

Counterpoint. Two Terms.

Text-books—Dr. Frederick Bridge and Dr. Francis E. Gladstone on Counterpoint.

Single Counterpoint in two parts. One, two, three and four notes against one; syncopation and retardation.

Single Counterpart in all forms in three and four voices.

Canon and Fugue.

Text-book—Richter Double Counterpoint and Fugue, Higgs on Fugue.

Analytical Harmony.

Open to students who have completed course in Harmony.

Study of harmonic structures and general study of musical form.

Composition and Instrumentation.

Study of form and composition and the instruments of the orchestra, etc.

Sight-Singing.

Beginning Class.—The work will embrace a thorough explanation of all the fundamental principles of music—notes, time, keys, major scales, intervals, arpeggios, common chords and chromatics. Special work in ear training.

Advanced Class.—The work will embrace the study of minor and chromatic scales, dominant and diminished seventh chords. Mordent, trill, appoggiatura, acciaccatura. Ear-training. Sight reading will be the great feature; and all who may understand the principle of reading at sight, yet do not have a practical knowledge thereof, will find the glees, anthems, part songs, etc., very interesting.

Voice.

The aim of this course is to develop, thorough deep breathing properly applied to voice placement, that full, resonant tone which has always characterized the artists trained in the Italian school, to attain a clear enunciation, a keener appreciation of the subtler meanings of the verbal text and an understanding of the foundational principles underlying all musical interpretation to the end that the singing may be distinguished by musicianly, scholarly qualities and deep, human sympathy.

Preparatory Course.

Breathing and voice placing exercises; sustained tones and scale work according to the Italian method as taught by Sims Reeves of London, England, and Vannucini of Florence, Italy. Concone's Fifty Lessons; Concone's Forty Lessons for Bass; Marchesi's Exercises, Op. 1, First Part; Vaccai's Studies.

College Course.

First Year. Voice placing exercises; scales, sustained tones, and articulation exercises; Marchesi's Studies; Concone's Twenty-five Lessons; songs by American composers, Denza, Cowen, Gastaldon, Jensen, Grieg, and Mendelssohn.

Second Year. Voice placing exercises continued; scales, etc., Marchesi's Studies; Concone's Fifteen Lessons; songs or solos by Schubert, Schumann, Grieg, Haendel, or other good foreign and American composers.

Third Year. Voice placing exercises continued; Marchesi's and Bordogni's exercises; solos from the standard oratorios and operas, Sullivan, Mendelssohn, Haendel, Mozart, and some of the Italian composers.

Fourth Year. Review of Haendelian arias; Beethoven, Wolf, Strauss, Brahms, and Franz songs; Wagnerian, and other opera solos.

Piano.

The course in this department is intended to meet the varying needs of individual pupils, with the idea of furnishing a comprehensive, rather than a rigid, inelastic training in piano-forte technic. While the acquirement of finger dexterity is necessary, the value and importance of the mental training to be obtained from the study of music is emphasized and the course is expected to make apparent the advantage of a broad musical education.

Preparatory Course.

The Preparatory Course is sufficiently simple to include beginners, and requires the study of the following exercises: Stephen Emory's Foundation Studies; Herz Scales; Handrock's Mechanical Studies; Enckhausen Progressive Melodious Studies, four books; Ehmant Petite Ecole Melodique, four books; Mathew's Graded Course, first four books.

The major and minor scales and major and minor chords must be played from memory, besides a variety of musical figures suggested by the various composition. These points are brought out by the use of works by Kohler, Duvernoy, Burgmuller, Gurlitt, and Schumann's studies for young students.

These fundamentals must be fully mastered before a pupil can be classified as a student in the Collegiate Musical Course. The mastery of these principles is of the greatest importance, as it is the only way to secure intelligent and sure progress in the advanced stages. No efforts will be spared to induce the student to work with that personal relish so necessary to good work.

College Course.

First Year. Major and minor scales and arpeggios.

Mathew's Graded Course, Books 5 and 6; Mason's Technics; Beren's New School of Velocity, Books 1 and 2; Selections from Clementi and

Kuhlau Sonatinas; Pieces by Bohm, Thome, Godard, Lebierre, Sapelnikoff; suitable novelties American or foreign.

Second Year. Scales and Double Thirds, etc.

Mathew's Graded Course, Book 7; Mason's Technics; Beren's New School of Velocity, Books 3 and 4; Low's Octave Studies; Selections from Haydn and Mozart Sonatas; Selections from Mendelssohn's Songs Without Words; Easier pieces of Chopin, also pieces by modern authors Chaminade, Rachmaninoff.

Third Year. Scales, etc.

Mathew's Graded Course, Books 8 and 9; Cramer's Etudes, Mason's Technics; Kullak's Octave Studies; Beethoven Sonatas; Compositions by Chopin, Schumann, Grieg, and other standard authors.

Fourth Year. Scales, etc.

Mathew's Graded Course, Book 10, or its equivalent; Chopin's Etudes; Beethoven Sonatas; Schumann's Symphonic Etudes, and Liszt's Compositions.

Pipe Organ.

In this course it is desirable that a student should have had a thorough course in piano finger technic, and have taken at least a year of Harmony as a prerequisite. As natural adaptation for the organ plays a great part in the student's progress on organ an outline only of the work is given.

The course comprises simple exercises for developing correctness and fluency in pedal playing; Thayer's Pedal Studies, together with easy preludes, chorals and trios, for cultivation of independence in manual and pedal; the easier works of Bach, Mendelssohn, Merkel and others.

Volckmar's Pedal Studies; Buck's Studies in Pedal Phrasing; Sonatas from Mendelssohn, Rheinberger, Ritter, and Bach.

The works of the modern French school form a large part of the repertoire taught in this course.

History of Music.

General history, development and influence of music among ancient peoples. Early Christian music. Polyphonic music.

Various schools of polyphonic music. The rise of dramatic and instrumental music, and the development of the various musical instruments.

The development of the Opera and Oratorio. The Romanticists. Modern music and musicians.

The above course can readily be accomplished in one year with two recitations a week. As the general object of the study is cultural, College students not pursuing music specially would be greatly benefited in a cultural sense by the pursuit of this study.

Interpretation Classes.

The study of Harmony is a prerequisite to entrance into this class.

The principal idea in the work of the classes in Interpretation is

"How to make music interesting." The work of this class is under the personal instruction of the Director, and all students in all departments are urged to broaden their musical horizon by attending for at least a few terms. Different composers, different instruments, tradition in song, the Rubato, and contrasts in tone color will be some of the subjects discussed. Many compositions will be performed by both students and teacher, and the culture here derived will be of the most practical sort.

Violin.

The aim in this course is to develop players of fine quality and to develop executive and interpretive power in the highest degree.

PREPARATORY COURSE.

Franz Wolfhart, Book I.

Violin Method for Beginners, O. Ševčik, Parts I, VI, VII. Easy pieces.

COLLEGE COURSE.

First Year. Preparatory Method of Violin Technics, O. Ševčik. Books I and II. Changes of Position and Preparatory Scale Studies. Prep. Studies in Double Stopping in Thirds, Sixths, Octaves and Tenths. Pieces by DeBeriot and others.

Second Year. Etudes by Kreutzer, Fiorillo and Rode. Concertos by Mozart, Wieniawski, and pieces by classic and modern composers.

Third Year. School of Violin Technics for Advanced Pupils, O. Ševčik, Books I, II, III and IV; Exercises in Double Stopping, Triple and Quadruple Stopping, Pizzicato, Flageolet-tones. Solos from Wieniawski, Ernst and Vieuxtemps.

Fourth Year. 40 Variations, O. Ševčik. Bow technics. Preludes Campagnoli, Caprices Paganini. Concerts from Paganini, Mendelssohn, Beethoven, Bruch, Saint Saens, etc.

BAND INSTRUMENTS.

Instruction is given in these instruments by Charles L. Mundhenk the director of the College Band.

Regulations.

Students must register and secure entrance cards (each semester) before they begin their lessons. A student may register at the beginning of the semester or for the unexpired portion thereof. The entrance card must be presented to the instructor at the first lesson.

All tuition is payable at time of registration. No deviation from this rule will be permitted unless the pupil, parent, or guardian makes application to the Director for an extension of time.

Students may enter at any time. Students may enroll for music alone without additional expense.

No pupil will be allowed to register at the regular semester rates for less than a full semester. Pupils taking less than a full semester will pay for their lessons at the following rates: Half-hour private lessons with Alexander S. Thompson, $1.00. Class lessons in Harmony, etc., 75 cents. Half-hour private lessons with Mrs. Thompson, $1.00. Preparatory Piano lessons with Mrs. Thompson, $1.00.

Only in case of protracted illness (two weeks or more duration), certified by a physician's statement, can any deduction be made for absence from lessons. In such cases the pupil will pay at the above rates for the lessons he has received, and the balance of the tuition paid will be refunded. All claims of this nature must be made and settled before the end of the term in which the absence occurs.

Students may enter the Conservatory at any time, but it is greatly to their advantage to enter, if possible, at the beginning of the semester.

Students entering within two weeks of the beginning of the semester will be charged for the full semester; after that time for the remainder of the semester and one week additional.

Regular music students may take such academic or college work in addition to their music, as may be agreed upon by the President of the College and the Dean of the Junior College, provided, they have had at least two and a half years of high school work or the equivalent.

By a regular music student is meant any person who takes in addition to his music specialty the theoretical work required in the music course.

The above regulation in no way interferes with students entering for music only at the Conservatory, and taking such branches as they desire to take, in other words taking music as a special student.

Tuition per Semester.

The following table shows the rates of tuition for private lessons of thirty minutes in length, one lesson or two lessons a week:

	First Semester		Second Semester	
Vocal:—	One	Two	One	Two
Alexander Stewart Thompson..........	$14.50	$27.00	$18.50	$33.00
Clara Dutton Thompson..............	14.50	27.00	18.50	33.00
Piano:—				
Alexander Stewart Thompson..........	14.50	27.00	18.50	33.00
Preparatory Piano:—				
Clara Dutton Thompson..............	13.00	23.00	15.00	27.00

	First Semester		Second Semester	
Harmony, Counterpoint or Fugue,	One	Two	One	Two
etc.:—(Private)	$13.00	$23.00	$15.00	$27.00

Pipe Organ:—				
Alexander Stewart Thompson	14.50	27.00	18.50	33.00
Clara Dutton Thompson	14.50	27.00	18.50	33.00
Brass Instruments:—				
Charles L. Mundhenk	13.00	23.00	15.00	27.00
	First Semester		Second Semester	
Violin and String Instruments:—	One	Two	One	Two
Herbert L. Houston	$14.50	$27.00	$18.50	$33.00
Ensemble:—				
Herbert L. Houston	14.50	27.00	18.50	33.00

Class Lessons.

Sight Singing Class:—	Two Lessons a Week	
Not less than ten in a class (one hour a week)	$ 2.50	$ 3.50
Harmony class	8.50	11.50
Counterpoint and Fugue	11.00	14.00
Interpretation:—		
Class limited to ten	6.50	8.50
Musical History	4.00	6.00

Other Expenses.

Piano Practice, one hour per day for the semester, $3.50; two hours per day, $6.50; three hours per day, $9.00.

Pipe Organ Practice, three hours per week for the semester, $3.50.

UNIVERSITY OF ILLINOIS
PRESIDENT'S OFFICE

LIST OF STUDENTS

SENIOR HONOR STUDENTS, 1908.

Each of the following has the highest average standing in the course represented:

M. W. Pullen—Electrical Engineering.
Elva Forman—General and Domestic Science.
G. R. Bliss—Horticulture.
Ellis Rail—Animal Husbandry.
E. F. Renken—Mechanical Engineering.
Louise Laurance—Domestic Science.
H. E. Bemis—Veterinary Medicine.
M. S. Sanders—Civil Engineering.
Ada Hayden—Science.
C. L. Mitchel—Dairy.

HONORS IN THE LITERARY CONTESTS.

Declamatory Contest, Spring Semester, 1907.

Oratorical Class—Ambrose Folker, Pythian. Title of selection, "Life's Emergencies."

Dramatic Class—Maude Mirick, Cliolian. Title of selection, "Tobe's Monument."

Oratorical Contest, Fall Semester, 1907.

First Prize—O. W. Johnson, Crescent. "The Power of Purpose."

Second Prize—C. R. Bush, Phileleutheroi. "The Power of Personality."

Third Prize—G. R. Bliss, Philomathean. "Shall Gold Rule the World?"

Inter-Society Debates, Spring Semester, 1907.

Question: "Resolved, That the personal property tax as in general operation throughout the country should be abolished."

Guy Frevert, C. R. Shumway, Crescents, vs. G. C. Pullen, Delbert Wheeler, Welch.

W. G. Langwill, C. J. Kelsey, Crescents, vs. C. W. Okey, C. J. Stout, Bachelors.

P. Van Gilst, G. Bader, Bachelor, vs. E. Rail, J. R. Campbell.

H. W. Wagner, L. S. Herron, Philomathean, vs. L. Gowdey, E. J. Phillips, Pythian.

I. D. Hadley, G. W. Patterson, Philomathean, vs. J. O. Rankin, C. H. Morrow, Phileleutheroi.

E. F. Ferrin, H. Hazen, Phileutheroi, vs. E. G. Cort, R. T. Lyans, Pythian.

Inter-Society Debate, Fall Semester, 1907.

Question: "Resolved, That the fifteenth amendment and section two of the fourteenth should be repealed, the difficulty of repeal not to enter into discussion."

E. F. Ferrin, H. Hazen, L. C. Shantz, Phileleutheroi, vs. I. D. Hadley, Theo. Sexauer, G. R. Bliss, Philomathean.

A. G. Thurman, J. G. Emerson, J. R. Campbell, Welch, vs. C. H. Schemann, Peter Sackrison, R. E. Richardson, Beardshear.

V. D. Beard, H. Vaughn, E. B. Lambert, Pythian, vs. C. W. Okey, G. E. Farmer, R. S. Moore, Bachelor.

Inter-Collegiate Debates, Fall Semester, 1907.

Debating League of Iowa State College and Iowa State Normal. Twelfth Annual Debate, second in the series of Dual Debates.

Question: "Resolved, That the personal property tax as in general operation throughout the country should be abolished."

The affirmative team for Iowa State College at Cedar Falls, against Iowa State Normal.

L. S. Herron, Philomathean.
G. C. Pullen, Welch.
Delbert Wheeler, Welch.

The negative team for Iowa State College at Ames, against Iowa State Normal.

Ellis Rail, Welch.
J. O. Rankin, Phileleutheroi.
H. W. Wagner, Philomathean.

Inter-Collegiate Debates, Spring Semester, 1908.

State Triangular Debating League (Iowa College, Drake University, Iowa State College). Third Annual Debate.

Question: "Resolved, That the 15th amendment should be repealed. The enforcement of the second section of the 14th amendment and the difficulties of repeal are not to enter into the discussion."

The affirmative team for Iowa State College, at Ames, against Drake University:

A. G. Thurman, Welch.
J. G. Emerson, Welch.
I. D. Hadley, Philomathean.

The negative team for Iowa State College at Grinnell, against Iowa College:

H. Vaughn, Pythian.
Geo. W. Patterson, Philomathean.
C. W. Okey, Bachelor.

POST GRADUATES.

Candidates for the Degree of Master of Scientific Agriculture.

Bower, John, B. S. A., (Ontario Agricultural College) 1906, Dairying, Harriston, Ontario, Canada.

Buckman, Harry O., B. S. A., (Iowa State College) 1906, Agricultural Chemistry, Ames, Iowa. West Liberty, Iowa.

Gribben, Ray Larimer, B. S. A., (Iowa State College) 1906, Animal Husbandry, Minburn, Iowa.

Greene, Laurenz, B. S., (Kansas State Agricultural College) 1906, Horticulture.

Jeffs, Royal E., B. S. A., (Iowa State College) 1906, Botany, Ames, Iowa.

Larson, Carl William, B. S. A., (Iowa State College) 1906, Agricultural Chemistry, Meltonville, Iowa.

Madson, B. A., B. S. A., (Iowa State College) 1907, Chemical Section, Ames, Iowa.

Merritt, M. L., B. S. A., (Iowa State College) 1904, Horticulture.

Morris, Evan L., B. S. A., (Iowa State College) 1907, Chemistry.

Smith, Orma J. B., B. S., (Ohio State University) 1907, Horticulture.

Wentworth, E. N., B. S. A., (Iowa State College) 1907, Animal Husbandry.

Candidates for the Degree of Master of Science.

Dudgeon, Winfield, B. S., (Iowa State College) 1907, Botany.

Nash, Nellie N., B. S., (Iowa State College) 1907, Chemistry, Ames, Iowa.

Ness, Henry, B. S. A., (Iowa State College) 1905, Zoology, Ames, Iowa.

SENIORS.

NAME	COURSE	TOWN	COUNTY
Allen, F. M.	C. E.,	Knoxville	Marion
Anderson, A. L.,	Agron.,	Ames	Story
Anderson, Gurine,	G. & D. S.	Stanhope	Hamilton
Arnold, R. A.,	A. H.,	Strawberry Pt	Clayton
Arthur, E. E.,	A. H.,	Des Moines	Polk
Atkinson, O. E.,	M. E.,	Laurens	Pocahontas
Austin, Jessie,	G. & D. S.,	Webster City	Hamilton
Ayres, Frank,	E. E.,	Knoxville	Marion
Bader, G.,	Sci.,	Monticello	Jones
Barclay, P. V.,	Agron.,	West Liberty	Muscatine
Batchelder, H. S.,	A. H.,	Lyons	Clinton
Baxter, Wm.,	Hort.,	Galva	Ida
Bemis, H. E.,	Vet.,	Cawker City	*Kansas*
Berggren, A. E.,	M. E.,	Marshalltown	Marshall
Biggs, F. G.,	M. E.,	Anita	Cass
Blackwell, Bert,	M. E.,	Newton	Jasper
Bliss, G. R.,	Hort.,	Corning	Adams
Breckerbaumer, H. E.,	Vet.,	Lewis	Cass
Bubke, H. P.,	E. E.,	Battle Creek	Ida
Buell, Walter E.,	C. E.,	Webster City	Hamilton
Burton, W. A.,	C. E.,	Ames	Story
Caldwell, H. V.,	Agron.,	Ames	Story
Campbell, Mabel,	D. S.,	Ames	Story
Canady, A. A.,	C. E.,	Gilbert Station	Story
Cave, F. E.,	C. E.,	Ames	Story
Christian, H. L.,	C. E.,	Des Moines	Polk
Churchill, F. G.,	A. H.,	Sewal	Wayne
Cooper, A. R.,	E. E.,	Ames	Story
Cooper, H. J.,	E. E.,	Ames	Story
Cruz, M. M.,	Agron.,	Santa Cruz,	*La Guna, Prov. P. I.*
Cunningham, D. H.,	A. H.,	Wayne	*Nebraska*
Davis, E. F.,	A. H.,	Corydon	Wayne
Deiling, N. J.,	Vet.,	Keokuk	Lee
Deming, R. M.,	C. E.,	Ames	Story
Denmead, D. H.,	A. H.,	Marshalltown	Marshall
Dewey, F. S.,	E. E.,	Ames	Story
Dickey, A. J.,	E. E.,	Cedar Falls	Black Hawk
Dixon, Vera,	Sci.,	Sac City	Sac
Dreher, Genevieve,	G. & D. S.,	Scranton	Greene
Dunlap, Beryle,	Vet.,	Shannon City	Union
Egloff, Ruth,	G. & D. S.,	Cedar Falls	Black Hawk
Ervin, Verna,	G. & D. S.,	Villisca	Montgomery
Farmer, I. W.,	C. E.,	Montezuma	Poweshiek
Forman, Elva	G. & D. S.,	Ames	Story
Fraseur, Clara,	G. & D. S.,	Tipton	Cedar
Fuhrmeister, R. S.,	A. H.,	Cedar Rapids	Linn
Garner, E. R.,	Hort.,	Ames	Story
Garner, H. E.,	E. E.,	Ida Grove	Ida
Gillette, Grace,	G. & D. S.,	Fostoria	Clay
Given, J. A.,	C. E.,	Des Moines	Polk
Goodrich, Floyd,	C. E.,	Ames	Story
Graham, G. G.,	Vet.,	Ames	Story
Gray, J. B.,	M. E.,	Morrison	*Illinois*
Greer, S. W.,	C. E.,	Marion	Linn
Griggs, E. V.,	E. E.,	Ames	Story
Guernsey, S. C.,	A. H.,	Plano	Appanoose

Guthrie, C. B.,	Dairy,	Coin	Page
Hadley, I. D.,	Agron.,	Earlham	Madison
Haefner, Henry,	Hort.,	Charles City	Floyd
Hall, A. G.,	C. E.,	Moravia	Appanoose
Halpenny, R. H.,	E. E.,	Ames	Story
Hargis, Sophie,	G. & D. S.,	Des Moines	Polk
Haskell, E. S.,	Agron.,	Ames	Story
Hayden, Ada,	Sci.,	Ames	Story
Haylor, A. F.,	M. E.,	Ft. Dodge	Webster
Higgins, F. H.,	A. H.,	Keswick	Keokuk
Herron, L. S.,	A. H.,	Ewing	*Nebraska*
Hollingsworth, A. L.,	Agron.,	Ames	Story
Hopkins, K. M.,	M. E.,	Villisca	Montgomery
Hunt, Clarence E.,	Vet.,	Oskaloosa	Mahaska
Hurst, D. W.,	Vet.,	Ames	Story
Johnson, C. J.,	E. E.,	Ames	Story
Johnson, E. M.,	Vet.,	Ames	Story
Johnson, Fay,	D. S.,	Boone	Boone
Jones, H. B.,	M. E.,	Humboldt	Humboldt
Jordan, R. F.,	M. E.,	Boone	Boone
Kilborne, Luella,	D. S.,	Ft. Dodge	Webster
Kildee, H. H.,	A. H.,	Osage	Mitchell
Kimball, Florence,	M. E.,	Council Bluffs	Pottawattamie
Kinnebrew, Claude	Agron.,	Corsicana	*Texas*
Kruel, A. H.,	E. E.,	Laurens	Pocahontas
Lambert, E. B.,	M. E.,	Newton	Jasper
Lampman, Roy,	E. E.,	Sutherland	O'Brien
Langlois, E. C.,	Hort.,	Humboldt	Humboldt
Langwill, W. G.,	Dairy,	Ames	Story
Laurance, Louise,	D. S.,	Cedar Rapids	Linn
Little, H. A.,	C. E.,	Webster City	Hamilton
Lyans, R. T.,	A. H.,	Center Junct.	Jones
Mack, G. H.,	C. E.,	Dows	Wright
Macomber, Stanley,	C. E.,	Ida Grove	Ida
Martin, G. L.,	Dairy,	Spencer	Clay
Meickley, K. B.,	Agron.,	Marshalltown	Marshall
Melvin, I. E.,	E. E.,	Bedford	Taylor
Miller, F. G.,	Vet.,	Storm Lake	Buena Vista
Miller, Laura,	Sci.,	Oxford	Jones
Mitchell, C. L.,	Dairy,	Ames	Story
Monroe, C. F.,	A. H.,	Ames	Story
Moore, L. J.,	E. E.,	Newton	Jasper
Moore, R. S.,	C. E.,	Davenport	Scott
Moore, W. E.,	C. E.,	Davenport	Scott
Mutch, Alex.,	Agron.,	Reinbeck	Grundy
McKibben, H. B.,	M. E.,	Storm Lake	Buena Vista
Nelson, Jas. M.,	Vet.,	Brooklyn	Poweshiek
Newlon, Mae,	G. & D. S,.	Ames	Story
O'Donnell, R. F.,	A. H.,	Ames	Story
Olson, O. A.,	M. E.,	Linn Grove	Buena Vista
Otis, H. R.,	E. E.,	Ames	Story
Ottosen, P. H.,	C. E.,	Ft. Dodge	Webster
Palmares, Balbino,	Agron.,	Passi, *Iloilo Prov.,*	*P. I.*
Parsons, B. F.,	E. E.,	Columbus Junct	Louisa
Parsons, F. W.,	C. E.,	Mason City	Cerro Gordo
Patton, M. C.,	C. E.,	Newton	Jasper
Paul, Denton,	C. E.,	Paullina	O'Brien
Paulson, L.,	Sci.,	Triumph	*Minnesota*
Peek, Welton,	A. H.,	Paullina	O'Brien

Peters, W. H.,	A. H.,	Keokuk	Lee
Phillips, Edmund,	C. E.,	Clarence	Cedar
Phillips, Howard,	A. H.,	Maquoketa	Jackson
Potter, Lena,	G. & D. S.,	Ames	Story
Powers, Geo.,	C. E.,	Boone	Boone
Price, Wm. O.,	C. E.,	Reinbeck	Grundy
Pullen, G. C.,	A. H,.	Onawa	Monona
Pullen, M. W.,	E. E.,	Onawa	Monona
Rail, Ellis,	A. H.,	Birmingham	Van Buren
Renken, E. F.,	M. E.,	Parkersburg	Butler
Reynolds, J. F.,	C. E.,	Storm Lake	Buena Vista
*Robinson, A. I.,	E. E.,	Stockton	Muscatine
Rudd, Ross,	E. E.,	Dow City	Crawford
Sackrison, Peter,	E. E.,	Williams	Hamilton
Sanders, M. S.,	C. E.,	Ft. Dodge	Webster
Schantz, L. C.,	E. E.,	Wayland	Henry
Scofield, W. J.,	C. E.,	Strawberry Pt	Clayton
Scott, C. J.,	Vet.,	Ackworth	Warren
Secor, Florence,	G. & D. S.,	Melbourne	Marshall
Seeley, B. A.,	Vet.,	Algona	Kossuth
Shaw, R. P.,	M. E.,	Cornforth	Poweshiek
Simpson, E. J.,	M. E.,	Anamosa	Jones
Smith, Adah,	G. & D. S.,	Gladbrook	Tama
Smith, B. R.,	C. E.,	Ames	Story
Smith, T. W.,	E. E.,	Renwick	Humboldt
Sones, C. M.,	E. E.,	Anamosa	Jones
Stebbins, A. W.,	M. E.,	Ellsworth	Hamilton
Storms, Lillian,	G. & D. S.,	Ames	Story
Strickler, W. L.,	M. E.,	Sibley	Osceola
Sturgeon, R. S.,	E. E.,	Clarion	Wright
Templeton, E. G.,	A. H.,	Ames	Story
Templeton, M. S.,	Sci.,	Ames	Story
Thayer, Starr,	E. E.,	Rock Valley	Sioux
Thompson, A. W.,	E. E.,	Davenport	Scott
Tiara, F. A.,	C. E.,	Polk	Polk
Troup, James,	E. E.,	Sioux City	Woodbury
Van Brunt, E. S.,	E. E.,	Council Bluffs	Pottawattamie
Vandenburgh, Edward,	C. E.,	Kingsley	Plymouth
Van Deventer, R. F.,	E. E.,	Hedrick	Keokuk
Van Duzer, Pearl,	G. & D. S.,	Ontario	Story
Van Gilst, P. C.,	M. E.,	Kilduff	Jasper
Waggoner, J. E.,	M. E.,	Primghar	O'Brien
Whannell, H. J.,	E. E.,	Traer	Tama
Wheeler, Delbert,	C. E.,	Ireton	Sioux
Wieland, A. L.,	M. E.,	Gladbrook	Tama
Wills, G. M.,	E. E.,	Eldora	Hardin
Wolfe, R. F.,	Vet.,	Shannon	Union
Yarnell, D. L.,	C. E.,	Le Mars	Plymouth
Zorn, H. E.,	E. E.,	Montezuma	Poweshiek
Zumwalt, A. R.,	Vet.,	Ames	Story

JUNIORS.

NAME	COURSE	TOWN	COUNTY
Agne, Glen,	A. H.,	Tipton	Cedar
Alexander, C. O.,	M. E.,	Ames	Story
Allen, S. W.,	Hort.,	Des Moines	Polk
Amesbury, H. C.,	C. E.,	Ames	Story

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*Deceased

Archer, Dorothy,	G. & D. S.,	Archer	O'Brien
Bakke, A. L.,	Sci.,	Forest City	Winnebago
Barton, R. H.,	A. H.,	Luverne	Kossuth
Beard, C. B.,	C. E.,	Des Moines	Polk
Beard, V. D.,	C. E.,	Osceola	Clarke
Beaty, John,	A. H.,	Madison	*South Dakota*
Bek, H. E.,	E. E.,	Massena	Cass
Belles, B. B.,	C. E.,	Fairfield	Jefferson
Bernick, Fritz,	E. E.,	Buffalo	Scott
Bielenberg, C. F.,	E. E.,	Keystone	Benton
Billedo, Mariano,	Agron.,	Bangued, *Abra,*	*P. I.*
Black, E. E.,	Vet.,	Ames	Story
Black, R. E.,	M. E.,	Liscomb	Marshall
Boardman, Lois K.,	Sci.,	Nevada	Story
Bodwell, R. E.,	E. E.,	Ida Grove	Ida
Booth, J. F.,	C. E.,	Anita	Cass
Boyd, L. R.,	C. E.,	Ames	Story
Breeden, F. L.,	E. E.,	Grinnell	Poweshiek
Broadie, R. W.,	C. E.,	Waverly	Bremer
Brugger, Fred,	M. E.,	Lake City	Calhoun
Burkhart, R. F.,	E. E.,	Hawkeye	Fayette
Burris, J. A.,	C. E.,	What Cheer	Keokuk
Bush, Chas. C. K.,	A. H.,	Washta	Cherokee
Campbell, Carlyle,	Dairy,	Ames	Story
Campbell, J. R.,	Hort.,	Blockton	Taylor
Campbell, P. C.,	C. E.,	Clear Lake	Cerro Gordo
Carr, E. B.,	E. E.,	Swaledale	Cerro Gordo
Case, H. M.,	Hort.,	Chicago	*Illinois*
Chappel, M. E.,	C. E.,	Des Moines	Polk
Clayton, D. W.,	M. E.,	Sibley	Osceola
Cockfield, J. H.,	M. E.,	Cedar Rapids	Linn
Collins, E. V.,	Agron.,	Marshalltown	Marshall
Cooper, C. W.,	E. E.,	Blairsburg	Hamilton
Cowan, L. F.,	C. E.,	Iowa Falls	Hardin
Craig, Dan,	C. E.,	Ames	Story
Crawford, M. O.,	M. E.,	Clarion	Wright
Crawford, N. N.,	Vet.,	Waukon	Allamakee
Crouse, R. C.,	E. E.,	Prescott	Adams
Cunningham, A. H.,	C. E.,	Goldfield	Wright
Darling, Eugene,	A. H.,	Fonda	Pocahontas
Davis, H. K.,	C. E.,	Knoxville	Marion
Davis, J. W.,	A. H.,	Avoca	Pottawattamie
Day, Georgia E.,	Sci.,	Keosauqua	Van Buren
Dengler, Harold,	M. E.,	Ames	Story
Dorman, B. L.,	C. E.,	Ames	Story
Dyer, Ruth,	Sci.,	Nevada	Story
Eby, V.,	C. E.,	Monticello	Jones
Edwards, Oscar,	E. E.,	Dow City	Crawford
Ellis, W. V.,	Vet.,	Ames	Story
Ewers, Ruth,	D. S.,	Wyanet	*Illinois*
Farmer, Geo.,	Sci.,	Sioux Rapids	Buena Vista
Farnsworth, F. B.,	M. E.,	Galva	Ida
Farnum, Faye,	Sci.,	Ames	Story
Forbes, W. A.,	A. H.,	Ames	Story
Forman, L. W.,	Agron.,	Ames	Story
Forsbeck, C. D.,	C. E.,	Gray	Audubon
French, L. R.,	C. E.,	Hawarden	Sioux
Gamrath, Carl,	Vet.,	Ames	Story
Garner, Della,	G. & D. S.,	Ida Grove	Ida

Garver, Samuel,	Agron.,	Farmington	Van Buren
Gillette, Millie,	Sci.,	Fostoria	Clay
Gilmore, Wm. J.,	C. E.,	Nevada	Story
Godfrey, G. W.,	A. H.,	Luverne	Kossuth
Gordon, B. E.,	E. E.,	Hedrick	Keokuk
Gray, R. B.,	E. E.,	Des Moines	Polk
Greene, W. M.,	C. E.,	Mt. Vernon	Linn
Griswold, D. T.,	A. H.,	Montrose	Lee
Hall, Herman,	M. E.,	Ames	Story
Hanssen, D. W.,	E. E.,	Carroll	Carroll
Harris, C. E.,	C. E.,	Fairfield	Jefferson
Hauser, B. B.,	C. E.,	Ames	Story
Hazen, H.,	A. H.,	Denmark	Lee
Heath, Royce,	C. E.,	Ames	Story
Heaton, Edward,	A. H.,	Shannon City	Union
Hewitt, M. C.,	E. E.,	Morning Sun	Louisa
Hitchcock, R. B.,	M. E.,	Greenfield	Adair
Hites, L. V.,	C. E.,	Des Moines	Polk
Hopkins, Ella,	G. & D. S.,	Nevada	Story
Hopkins, Francis,	D. S.,	Nevada	Story
Hubbard, H. C.,	M. E.,	Ida Grove	Ida
Huffman, O. L.,	C. E.,	Wyoming	Jones
Hugg, John,	M. E.,	Polk	Polk
Humphrey, M. T.,	E. E.,	Marshalltown	Marshall
Hutchison, Bryce,	Mn. E.,	Ames	Story
Hutchinson, L. S.,	Mn. E.,	Iowa Falls	Hardin
Jepson, M. S.,	A. H.,	Moorhead	Monona
Johnson, O. W.,	A. H.,	Le Grand	Marshall
Jones, F. D.,	C. E.,	Ames	Story
Jones, Gertrude,	D. S.,	Ames	Story
Jones, R. H.,	C. E.,	Des Moines	Polk
Jongewaard, Neal,	Vet.,	Sioux Center	Sioux
Kelley, E. F.,	C. E.,	Hampton	Franklin
Kelsey, L. D.,	C. E.,	Des Moines	Polk
Kerr, F. L.,	A. H.,	Manilla	Crawford
King, H. W.,	E. E.,	Waterloo	Black Hawk
King, J. E.,	E. E.,	Ames	Story
Kirkpatrick, J. G.,	E. E.,	Waterloo	Black Hawk
Kirkpatrick, K. A.,	Hort.,	South English	Keokuk
Knapp, Seaman,	C. E.,	Ames	Story
Kulp, A. I.,	Vet.,	Adel	Dallas
Lambert, E. W.,	Mn. E.,	Ames	Story
Lambert, Guy,	Dairy,	Ames	Story
Lan, E. F.,	Vet.,	Buenos Ayres	*Argentine Rep.*
Lane, W. G.,	E. E.,	Mason City	Cerro Gordo
Larson, F. W.,	Vet.,	Meltonville	Worth
Law, F. W.,	Vet.,	Ames	Story
Leckliter, W. H.,	C. E.,	Corning	Adams
Lidvall, E. R.,	Mn. E.,	Dayton	Webster
Lister, J. A.,	M. E.,	Sibley	Osceola
Lockwood, R. L.,	C. E.,	Osceola	Clarke
Luick, H. F.,	A. H.,	Belmond	Wright
Maine, Kenneth,	M. E.,	Des Moines	Polk
Manson, Frank,	E. E.,	Sibley	Osceola
Martin, C. W.,	A. H.,	Carroll	Carroll
Mason, R. J.,	A. H.,	Iowa Falls	Hardin
Maxwell, Mildred,	G. & D. S.,	Ames	Story
Merrill, J. W.,	A. H.,	Ames	Story
Miller, R. B.,	C. E.,	Storm Lake	Buena Vista

Mills, Geo. A.,	E. E.,	Waterloo	Black Hawk
Milton, I. L.,	E. E.,	Stanwood	Cedar
Miner, Ward,	A. H.,	Shellrock	Butler
Minert, Jessie,	G. & D. S.,	Ames	Story
McArthur, Wm.,	A. H.,	Mason City	Cerro Gordo
McCain, G. L.,	M. E.,	Des Moines	Polk
McCullough, T. E.,	C. E.,	Davenport	Scott
McElyea, H. B.,	E. E.,	Ames	Story
McFarland, J. D.,	C. E.,	Des Moines	Polk
McKeen, Jesse,	E. E.,	Tama	Tama
Naiden, F. S.,	C. E.,	Woodward	Dallas
Nazarine, E. G.,	M. E.,	Dallas Center	Dallas
Nichols, C. S.,	C. E.,	Ames	Story
Okey, C. W.,	C. E.,	Prescott	Adams
Orcutt, L. E.,	M. E.,	Council Bluffs	Pottawattamie
Orr, Harry,	C. E.,	Waukon	Allamakee
Paine, F. D.,	E. E.,	Algona	Kossuth
Paulson, Fred,	E. E.,	Avoca	Pottawattamie
Pechstein, J. H.,	M. E.,	Keokuk	Lee
Pierce, Foster,	Vet.,	Denison	Crawford
Platt, S. G.,	Hort.,	Oelwein	Fayette
Prior, La Rue,	M. E.,	Marion	Linn
Quaife, A. E.,	Agron.,	Ionia	Chickasaw
Reppert, P. L.,	E. E.,	Cumberland	Cass
Reuling, R. E.,	M. E.,	Muscatine	Muscatine
Rhine, E. B.,	C. E.,	Eldora	Hardin
Rhoades, W. J.,	Agron.,	Oakland	Pottawattamie
Riedesel, R. C.,	M. E.,	Charter Oak	Crawford
Rightmire, John,	C. E.,	Ames	Story
Robinson, H. E.,	Mn. E.,	Sloan	Woodbury
Ruppel, A. C.,	A. H.,	Webster City	Hamilton
Russell, Monroe,	A. H.,	Sibley	Osceola
Sanders, Gilbert,	C. E.,	Postville	Allamakee
Schaeffer, L. L.,	Hort.,	Eagle Grove	Wright
Schenck, E. E.,	C. E.,	Waterloo	Black Hawk
Schjeldahl, T.,	C. E.,	Highlandville	Winneshiek
Schlick, W. J.,	C. E.,	Indianola	Warren
Schmidt, Will,	C. E.,	Avoca	Pottawattamie
Schrieber, Fred,	C. E.,	Chariton	Lucas
Schroeder, W. N.,	Mn. E.,	Rock Island	*Illinois*
Schworm, F. G.,	C. E.,	Nevada	Story
Sexauer, Theo.,	Agron.,	Ankeny	Polk
Sexsmith, Perlee,	E. E.,	West Liberty	Muscatine
Shannon, C. W.,	M. E.,	Grant City	Sac
Shannon, J. L.,	Vet.,	Barbados	*B. W. I.*
Smith, H. C.,	E. E.,	Britt	Hancock
Smith, L. E.,	Vet.,	Jefferson	Greene
Smith, Roy E.,	Agron.,	Canton	*So. Dakota*
Smith, Roy R.,	C. E.,	Rockwell City	Calhoun
Smith, Wilbur C.,	Vet.,	Ames	Story
Snyder, C. J.,	E. E.,	Dubuque	Dubuque
Stong, G. C.,	Vet.,	Kilbourne	Van Buren
Stoufer, D. B.,	M. E.,	Marion	Linn
Street, A. B.,	E. E.,	Ames	Story
Summers, J. F.,	A. H.,	Malvern	Mills
Templeton, R. M.,	C. E.,	Ames	Story
Todnem, O. H.,	Mn. E.,	Ames	Story
Tusant, W. E.,	C. E.,	Des Moines	Polk
Underwood, J. R.,	Vet.,	Ames	Story

Upton, Louise,	Sci.,	Fayette	Fayette
Van de Steeg, G. J.,	E. E.,	Orange City	Sioux
Van de Waa, Henry,	Vet.,	Orange City	Sioux
Van Marter, C. C.,	C. E.,	Ames	Story
Velander, Verne,	M. E.,	Stanton	Montgomery
Vincent, F. C.,	E. E.,	Shenandoah	Page
Wagner, Chas. W.,	C. E.,	Des Moines	Polk
Wagner, H. W.,	E. E.,	Calamus	Clinton
Wambeam, H. I.,	E. E.,	Ames	Story
Ware, S. H.,	C. E.,	Blairsburg	Hamilton
Warsaw, C. E.,	E. E.,	Riceville	Mitchell
Watts, Ruth R.,	G. & D. S.,	Ames	Story
Waugh, E. N.,	A. H.,	Roland	Story
Wells, W. T.,	E. E.,	Marathon	Buena Vista
White, P. H.,	M. E.,	Keokuk	Lee
Williams, C. M.,	M. E.,	Parkersburg	Butler
Williams, L. A.,	E. E.,	Council Bluffs	Pottawattamie
Williams, P. R.,	E. E.,	Clear Lake	Cerro Gordo
Wilson, Platt,	C. E.,	Montezuma	Poweshiek
Winslow, L. M.,	A. H.,	Ames	Story
Witmer, Stewart,	C. E.,	Des Moines	Polk
Young, C. R.,	A. H.,	Ames	Story
Zornig, H. H.,	E. E.,	Newhall	Benton

SOPHOMORES.

NAME	COURSE	TOWN	COUNTY
Abrahamson, John,	C. E.,	Morning Sun	Louisa
Adams, H. E.,	C. E.,	Cedar Rapids	Linn
Alexander, G. W.,	E. E.,	Oskaloosa	Mahaska
Andre, Edna,	G. & D. S.,	Schaller	Sac
Andrews, R. G.,	Sci.,	Omaha	*Nebraska*
Armstrong, Alice,	G. & D. S.,	Chicago	*Illinois*
Austin, F. H.,	C. E.,	Webster City	Hamilton
Baker, A. G.,	C. E.,	Eldora	Hardin
Baker, H. R.,	Mn. E.,	Eldon	Wapello
Baker, Margaret,	D. S.,	Rockwell City	Calhoun
Ballantyne, F. I.,	M. E.,	Des Moines	Polk
Barber, S. A.,	E. E.,	Corwith	Hancock
Barry, O. T.,	M. E.,	Cedar Rapids	Linn
Beattie, W. S.,	C. E.,	Welton	Clinton
Beecher, M. F.,	Cer.,	Mason City	Cerro Gordo
Bergman, H. D.,	Vet.,	Newton	Jasper
Beuck, Henry,	A. H.,	Avoca	Pottawattamie
Bittenbender, H. A.,	A. H.,	Osage	Mitchell
Black, Clyde,	Hort.,	Dexter	Dallas
Black, Wm. H.,	A. H.,	Ft. Dodge	Webster
Bliss, C. F.,	Hort.,	Iowa Falls	Hardin
Blumenschein, Ed.,	C. E.,	Rhodes	Marshall
Board, A. R.,	E. E.,	Marcus	Cherokee
Boden, O. G.,	C. E.,	Ames	Story
Boling, A. J.,	M. E.,	Bagley	Guthrie
Bolles, L. C.,	C. E.,	Ames	Story
Booher, Edith,	G. & D. S,.	Danbury	Woodbury
Britson, J. E.,	C. E.,	Roland	Story
Brown, Chas.,	Vet.,	Dana	Greene
Buchanan, John	Sci.,	Eagle Grove	Wright
Budd, June Etta,	Sci.,	Shellsburg	Benton
Buell, W. Elijah,	C. E.,	Lyons	Clinton

Bullen, Arthur,	M. E.,	Pueblo	*Colorado*
Burger, A. A.,	A. H.,	Van Meter	Dallas
Burkhalter, C. S.,	C. E.,	Rockwell City	Calhoun
Butler, D. V.,	C. E.,	Nashua	Chickashaw
Cable, E. Y.,	Agron.,	Waterloo	Black Hawk
Calonkey, Josephine,	G. & D. S.,	Woodward	Dallas
Campbell, Geo.,	M. E.,	Newton	Jasper
Carlson, R. Q.,	A. H.,	Meridan	Cherokee
Carlson, W. R.,	C. E.,	Hampton	Franklin
Carpenter, B. A.,	E. E.,	State Center	Marshall
Carpenter, C. C.,	M. E.,	Marion	Linn
Carpenter, J. C.,	C. E.,	Cresco	Howard
Carson, H. J.,	M. E.,	Council Bluffs	Pottawattamie
Chase, F. H.,	E. E.,	Colorado Spr'gs	*Colorado*
Chase, Orin,	C. E.,	McIntire	Mitchell
Chatterton, Ralph,	E. E.,	Peterson	Clay
Cheney, H.,	A. H.,	Emerson	Mills
Clark, Clarissa,	Sci.,	Ames	Story
Clark, P. B.,	M. E.,	Yetter	Calhoun
Clark, Sadie,	Sci.,	Ames	Story
Cleveland, W. J.,	Vet.,	Havelock	Pocahontas
Cline, J. D.,	Vet.,	Ames	Story
Coleman, R. V.,	A. H.,	Hillsboro	Henry
Collins, Floyd,	A. H.,	Boone	Boone
Collins, G. C.,	A. H.,	Dallas Center	Dallas
Conger, Carol,	G. & D. S.,	Adel	Dallas
Cooley, D. M.,	M. E.,	Strawberry Pt.	Clayton
Cooney, F. H.,	C. E.,	Coon Rapids	Carroll
Cooper, E. E.,	A. H.,	Corning	Adams
Copeland, F. B.,	Vet.,	Logan	Harrison
Corneliussen, C. W.,	E. E.,	Alta	Buena Vista
Coutts, H. G.,	C. E.,	Grinnell	Poweshiek
Cover, L. G.,	E. E.,	Dunlap	Harrison
Cox, Frank,	A. H.,	Adair	Adair
Cox, I. W.,	C. E.,	Ames	Story
Cox, L. W.,	C. E.,	Ames	Story
Coykendall, C.,	C. E.,	Dedham	Carroll
Cramer, W. H.,	M. E.,	Reasnor	Jasper
Crawford, Arch,	C. E.,	Cherokee	Cherokee
Creel, Edward,	A. H.,	Chihuahua	*Mexico*
Crewdson, Archie,	Vet.,	Woodbine	Harrison
Crowley, P. W.,	Dairy,	Galva	Ida
Cruttenden, A. H.,	E. E.,	Des Moines	Polk
Cushing, W. T.,	A. H.,	Ottumwa	Wapello
Davenport, Will,	A. H.,	Odebolt	Sac
Davis, C. W.,	A. H.,	Allison	Butler
Davis, E. C.,	A. H.,	Hedrick	Wapello
Davis, Grace,	Sci.,	Scranton	Greene
Davis, R. E.,	M. E.,	New Virginia	Warren
Deacon, E. L.,	C. E.,	Ames	Story
Deakin, Merrill,	C. E.,	Ames	Story
Deal, Maud,	G. & D. S.,	Ames	Story
Dorsey, S. H.,	E. E.,	Greenfield	Adair
Dragoun, Frank,	C. E.,	Toledo	Tama
Drury, W. F.,	Mn. E.,	Dexter	Dallas
Eby, Chas.,	C. E.,	Waterloo	Black Hawk
Edmonds, W. E.,	M. E.,	Sioux City	Woodbury
Egan, Chas. B.,	C. E.,	Atlantic	Cass
Estel, E. S.,	Dairy,	Marshalltown	Marshall

Evans, J. P.,	C. E.,	Marcus	Cherokee
Everett, Edna,	G. & D. S.,	Spirit Lake	Dickinson
Evers, H. C.,	Vet.,	Iowa Falls	Hardin
Ewen, Earl,	A. H.,	Callender	Webster
Ferrin, E. F.,	A. H.,	Cherokee	Cherokee
Folker, A. D.,	A. H.,	Mt. Sterling	Van Buren
Ford, J. C.,	C. E.,	Des Moines	Polk
Forrest, A. C.,	Dairy,	Garner	Hancock
Fowler, E. S.,	C. E.,	Radcliffe	Hardin
France, B. L.,	A. H.,	Moville	Woodbury
French, Franklin,	G. & D. S.,	Humboldt	Humboldt
Frevert, G.,	Dairy,	Odebolt	Sac
Fultz, T. G.,	Vet.,	Ames	Story
Gilbert, Guy,	Vet.,	Gilbert Sta.	Story
Gilbert, Ray,	Vet.,	Gilbert Sta.	Story
Gilchrist, Margaret,	G. & D. S.,	Ames	Story
Glidden, Edith,	G. & D. S.,	Ames	Story
Gockley, W. L.,	E. E.,	Whittemore	Kossuth
Gowdey, Louis,	Hort.,	Dexter	Dallas
Graham, M. L.,	Mn. E.,	Ames	Story
Graham, Robt.,	Vet.,	Ames	Story
Gray, W. Glen,	Vet.,	Ames	Story
Greenwald, Karl,	M. E.,	New Hampton	Chickasaw
Greer, J. R.,	C. E.,	Marion	Linn
Greer, Murl,	G. & D. S.,	Ames	Story
Gregory, C. V.,	A. H.,	Burchinal	Cerro Gordo
Hallowell, Inez,	D. S.,	Dow City	Crawford
Hamilton, J. W.,	Vet,	Hawarden	Sioux
Hanson, R. E.,	Vet.,	Forest City	Winnebago
Hardman, C. J.,	A. H.,	Commerce	*Georgia*
Harp, P. W.,	A. H.,	Prairie City	Jasper
Haskins, W. A.,	Agron.,	Whitten	Hardin
Haw, E. P.,	C. E,.	Ellsworth	*Wisconsin*
Herbert, H. M.,	A. H.,	Atlantic	Cass
Hill, H. T.,	Sci.,	Ames	Story
Horton, J. O.,	C. E.,	Nashua	Chickasaw
Horton, Maude,	G. & D. S.,	Ames	Story
Howes, R. L.,	E. E.,	Clinton	Clinton
Hoyt, E. L.,	M. E.,	Omaha	*Nebraska*
Hoyt, S. H.,	C. E.,	Mason City	Cerro Gordo
Hultman, Arthur,	E. E.,	Sioux City	Woodbury
Hungerford, Josephine,	Sci.,	Carroll	Carroll
Hyland, John,	C. E.,	Osceola	Clark
Ines, Leon,	C. E.,	Vigan	*Ilocos Sur, P. I.*
Ineson, M. W.,	C. E.,	Dallas Center	Dallas
Iverson, W. C.,	A. H.,	Sergeant Bluff	Woodbury
Jackley, J. G.,	Vet.,	Coon Rapids	Carroll
Jackson, H. D.,	E. E.,	Ames	Story
Jeffries, G. C.,	Vet.,	Mitchellville	Polk
Johnson, E. E.,	E. E.,	Williams	Hamilton
Johnson, F. B.,	E. E.,	Waukon	Allamakee
Johnson, Geo.,	E. E.,	Decorah	Winneshiek
Johnson, R. C.,	E. E.,	Hawarden	Sioux
Johnston, W. D.,	C. E.,	Waterloo	Black Hawk
Joiner, M. W.,	A. H.,	Maquoketa	Jackson
Jones, F. O.,	C. E.,	Ames	Story
Jones, Helen M.,	G. & D. S.,	Allison	Butler
Jones, H. W.,	C. E.,	Ames	Story
Ka Del, Orpha,	Sci.,	Ames	Story

Kalb, H. N.,	E. E.,	Denison	Crawford
Kemler, C. H.,	E. E.,	Dubuque	Dubuque
Kendall, R. W.,	M. E.,	Burlington	Des Moines
King, F. E.,	Sci.,	Ames	Story
Kingman, F. C.,	Agron.,	Des Moines	Polk
Knoche, A.,	E. E.,	Cedar Falls	Black Hawk
Knowles, F. C.,	Mn. E.,	Kingsley	Plymouth
Knudson, Susie,	Sci.,	Nevada	Story
Korf, E. T.,	C. E.,	Newton	Jasper
Kraft, John,	C. E.,	Des Moines	Polk
Kyhl, L. C.,	E. E.,	Miles	Jackson
Landes, G. B.,	M. E.,	Keosauqua	Van Buren
Langseth, Ruth,	G. & D. S.,	Dixon	Scott
Laughlin, F. L.,	A. H.,	Osage	Mitchell
Law, V. V.,	M. E.,	Ames	Story
Leffler, J. M.,	A. H.,	Stockport	Van Buren
Legenhausen, A. H.,	Vet.,	Fenton	Kossuth
Leibrock, L. L.,	Mn. E.,	Elkader	Clayton
Leonard, A. C.,	E. E.,	Elliott	Montgomery
Lockwood, H. A.,	A. H.,	Central City	Linn
Long, G. J.,	E. E.,	Thornton	Cerro Gordo
Longnecker, A. C.,	C. E.,	Shelby	Shelby
Lowdermilk, H. K.,	Mn. E.,	Des Moines	Polk
Luberger, H. S.,	A. H.,	Cedar Rapids	Linn
Lungren, A. F.,	Sci.,	Gowrie	Webster
Lusk, R. E.,	C. E.,	Eagle Grove	Wright
Macklin, T.,	A. H.,	Ames	Story
Madson, Anna,	G. & D. S.	Ames	Story
Madson, Nina,	G. & D. S.,	Ames	Story
Mantor, H. O.,	Vet.,	Salt Lake City	*Utah*
Martin, C. E.,	C. E.,	Des Moines	Polk
Martin, Helen,	G. & D. S.,	Newton	Jasper
Mason, J. W.,	E. E.,	Hedrick	Keokuk
Matter, Otto,	E. E.,	Polk	Polk
Maytag, L. B.,	M. E.,	Newton	Jasper
Menary, A. R.,	Vet.,	Cedar Rapids	Linn
Mercer, J. M.,	E. E.,	Greenfield	Adair
Merten, C. F.,	C. E.,	Garner	Hancock
Meyer, J. E.,	C. E.,	Marcus	Cherokee
Miller, H. C.,	C. E.,	Eldora	Hardin
Mirick, Maude,	Sci.,	Monticello	Jones
Mondonedo, Mariano,	Agron.,	Gamu	*Isabela, P. I.*
Morris, E. A.,	E. E.,	Ames	Story
Morrison, G. W.,	M. E.,	Adelphi	Polk
Morrow, C. H.,	M. E.,	Conrad	Grundy
Myerly, H. B.,	E. E.,	Des Moines	Polk
Myers, B. S.,	C. E.,	Dexter	Dallas
Myers, L. C.,	A. H..	Shellrock	Butler
McCall, F. E.,	Hort.,	Ames	Story
McCall, Thos.,	Hort.,	Ames	Story
McCartney, R. E.,	E. E.,	Cedar Rapids	Linn
McCormick, A. G.,	A. H.,	Mt. Pleasant	Henry
McCormick, Robt.,	C. E.,	Des Moines	Polk
McCulla, Alma,	G. & D. S.,	St Ansgar	Mitchell
McCulloch, B. E.,	Vet.,	Donellson	Lee
McDonald, Murl,	Agron.,	Ames	Story
McElroy, D. W.,	E. E.,	Keokuk	Lee
McFarland, F. M.,	E. E.,	Harlan	Shelby
Nelson, G. M.,	A. H.,	Goldfield	Wright

Nelson, L. A.,	A. H.,	Harlan	Shelby
Nicolay, J. J.,	M. E.,	Postville	Allamakee
Noble, J. A.,	E. E.,	Ames	Story
Nygren, H. J.,	Vet.,	Lake City	*Minnesota*
O'Donnel, Walter,	A. H.,	Ames	Story
O'Leary, J. E.,	C. E.,	Mason City	Cerro Gordo
Olson, Athyl,	D. S.,	Sac City	Sac
Palmer, W. H.,	C. E.,	Des Moines	Polk
Pammel, Edna,	Sci.,	Ames	Story
Parsons, Amy,	D. S.,	Keokuk	Lee
Patterson, G. W.,	A. H.,	Burt	Kossuth
Person, L. C.,	A. H.,	Sibley	Osceola
Pooley, R. J.,	C. E.,	Greene	Butler
Prescott, E. C.,	E. E.,	Sioux City	Woodbury
Prouty, E. D.,	M. E.,	Keokuk	Lee
Randau, Fred,	A. H.,	Ames	Story
Ray, Frank,	Hort.,	Des Moines	Polk
Reeves, A. B.,	C. E.,	Sibley	Osceola
Reynolds, W. E.,	C. E.,	Storm Lake	Buena Vista
Roberts, Coral,	G. & D. S.,	Marathon	Buena Vista
Robinson, F. A.,	Mn. E.,	Colfax	Jasper
Rohwer, A. C.,	E. E.,	Denison	Crawford
Rowat, J. F.,	C. E.,	Des Moines	Polk
Rutledge, I. C.,	Agron.,	Ft. Dodge	Webster
Sanders, J. S.,	Vet.,	Ames	Story
Schemann, C. H.,	C. E.,	Des Moines	Polk
Schroeder, E. F.,	E. E.,	Davenport	Scott
Scoates, D.,	C. E.,	S. Milwaukee	*Wisconsin*
Scothorn, R. A.,	Vet.,	Oelwein	Fayette
Semmons, Mildred,	G. & D. S.	Ames	Story
Sharp, E. P.,	C. E.,	Dow City	Crawford
Sheffield, F. F.,	Mn. E.,	Eldora	Hardin
Sherwood, R. M.,	A. H.,	Shabbona	*Illinois*
Shiffer, J. A.,	M. E.,	Tipton	Cedar
Shoals, J. W.,	Agron.,	Valliant	*Ind. Territory*
Shumway, C. R.,	A. H.,	State Center	Marshall
Slater, C. V.,	C. E.,	Des Moines	Polk
Sloane, Luther,	E. E.,	Sioux City	Woodbury
Smith, Cecile,	G. & D. S.,	Ames	Story
Smith, Dan M.,	Vet.,	Ames	Story
Smith, P. T.,	A. H.,	Canton	*So. Dakota*
Sonner, Gussie,	Sci.,	Ollie	Keokuk
Soth, A. A.,	Mn. E.,	Toledo	Tama
Spencer, R. L.,	M. E.,	Des Moines	Polk
Sprague, A. W.,	Vet.,	Council Bluffs	Pottawattamie
Springer, Spencer,	E. E.,	Eddyville	Wapello
Stafford, H. A.,	Agron.,	Blairsburg	Hamilton
Steigerwalt, Sam,	C. E.,	Ames	Story
Stewart, Dale,	Vet.,	Maynard	Fayette
Stewart, E. L.,	Agron.,	Washington	Washington
Storms, Laura,	G. & D. S.,	Ames	Story
Stout, C. R..	A. H.,	Des Moines	Polk
Strong, H. L.,	M. E.,	Humboldt	Humboldt
Strother, R. R.,	C. E.,	Hubbard	Hardin
Taylor, I. I.,	C. E.,	Ames	Story
Tellier, G. H.,	Dairy,	Humboldt	Humboldt
Thomas, Helen,	G. & D. S.,	Charles City	Floyd
Thomas, Roy,	Mn. E.,	Buxton	Monroe
Thurman, A. G.,	A. H.,	Blanchard	Page

Troutner, Edith,	Sci.,	Charles City	Floyd
Trullinger, Robt.,	C. E.,	Farragut	Fremont
Turner, M. W.,	C. E.,	Atlantic	Cass
Van Meter, M. E.,	E. E.,	Manilla	Crawford
Van Slyke, Fred	C. E.,	Mitchellville	Polk
Wakefield, Helen,	D. S.,	Sioux City	Woodbury
Wallace, H. A.,	A. H.,	Des Moines	Polk
Wallace, M. Ruth,	G. & D. S.,	Mendota	*Illinois*
Walter, R. E.,	E. E.,	Harlan	Shelby
Waterman, C. R.,	E. E.,	Newell	Buena Vista
Watts, Helen,	G. & D. S.,	Ames	Story
Weirick, Ray,	C. E.,	Ames	Story
Wentworth, W. A.,	Agron.,	State Center	Marshall
Wettengel, Frank,	E. E.,	Dunlap	Harrison
Whalen, W. T.,	E. E.,	Boone	Boone
White, Myrle,	G. & D. S.,	Ames	Story
White, S. K.,	Hort.,	Hartford	*Connecticut*
Wiggins, J. M.,	C. E.,	Cooper	Greene
Wilcox, H. F.,	Hort.,	Marshalltown	Marshall
Wilson, Halle,	G. & D. S.,	Cincinnati	Appanoose
Wilson, Ralph, E.,	E. E.,	Stanwood	Cedar
Wood, A. B.,	C. E.,	Fonda	Pocahontas
Wood, J. R.,	M. E.,	Ames	Story
Wood, L. A.,	E. E.,	Fonda	Pocahontas
Wyse, L. C.,	E. E.,	Wayland	Henry
Yeomans, H. C.,	M. E.,	Ames	Story
Yocum, J. R.,	E. E.,	Des Moines	Polk
Young, G. H.,	Agron.,	Des Moines	Polk
Zimmerman, A. G.,	Agron.,	Washta	Cherokee
Zimmerman, Phoebe,	G. & D. S.,	Ames	Story

FRESHMEN.

NAME	COURSE	TOWN	COUNTY
Albaugh, Carl,	E. E.,	Cedar Rapids	Linn
Amborn, Rolla,	M. E.,	Ft. Madison	Lee
Amesbury, E. G.,	C. E.,	Springfield	*So. Dakota*
Anderson, May,	G. & D. S.,	Ames	Story
Andrews, E. E.	C. E.	Des Moines	Polk
Andrews, H. L.	C. E.	Meriden	Cherokee
Apple, A. B.,	E. E.,	Rock Rapids	Lyon
Armour, H. B.	Sci.	Little Rock	Lyon
Armstrong, B. W.	A. H.	Hawarden	Sioux
Arnold, J. D.	E. E.	Garden Grove	Decatur
Arnold, Maude	G. & D. S.	Ames	Story
Askey, G. R.	A. H.	Red Oak	Montgomery
Axtell, Chas. E.	M. E.	Ames	Story
Baird, E. S.	E. E.	Prairie City	Jasper
Baker, Osmon D.	A. H.	Edmund	*Wisconsin*
Baldwin, W. H.	E. E.	Braddyville	Page
Ballard, F. S.	Vet.	Ames	Story
Barclay, M. S.	A. H.	West Liberty	Muscatine
Barger, W. W.	Vet.	Lacona	Warren
Barker, Angeline	C. E.	Rowan	Wright
Barndt, H. P.	Mn. E.	Des Moines	Polk
Barner, Samuel	A. H.	Coon Rapids	Carroll
Barrett, Robt. L.	Hort.	Osage	Mitchell
Barry, R. J.	E. E.	Cedar Rapids	Linn
Bartlett, John	C. E.	Sioux City	Woodbury

Barton, Merrills	Vet.	Kirkman	Shelby
Baumbach, John	C. E.	Pleasant Valley	Scott
Baxter, Sam G.	A. H.	Buckingham	Tama
Beardshear, Chas.,	A. H.,	Ames	Story
Bearshear, Wm. M.	Sci.	Ames	Story
Beebe, F. W.	A. H.	Paullina	O'Brien
Beiter, G. C.	C. E.	Carroll	Carroll
Bemis, P. R.	A. H.	Bondurant	Polk
Benson, A. W.	C. E.	Des Moines	Polk
Beresford, Rex	A. H.	Vinton	Benton
Bergen, Hansen	Sci.	Dubuque	Dubuque
Beverly, A. L.	Vet.	Ames	Story
Bevino, Noel	Vet.	Hawkeye	Fayette
Bielenberg, T.	E. E.	Catford	*England*
Bigelow, Clarence	E. E.	Valley Junction	Polk
Biller, Antoinette	G. & D. S.	Hartington	*Nebraska*
Blair, James	C. E.	Ames	Story
Blake, F. N.	A. H.	Maquoketa	Jackson
Born, A. Lee	Vet.	Story City	Story
Bower, John H.	Vet.	West Union	Fayette
Boyd, Van	Vet.	Ames	Story
Brennan, J. L.	Mn. E.	McGregor	Clayton
Brennan, Regina	D. S.	McGregor	Clayton
Bristol, Fred	C. E.	Des Moines	Polk
Brotchie, R. W.	C. E.	Atalissa	Muscatine
Brotchie, W.	C. E.	Atalissa	Muscatine
Brown, Chas. E.	C. E.	Sibley	Osceola
Brown, E. H.	C. E.	Albert Lea	*Minnesota*
Brown, Fay M.	D. S.	Council Bluffs	Pottawattamie
Browne, H. H.	M. E.	Knoxville	Marion
Brown, Joe	E. E.	Sioux City	Woodbury
Brown, Roy E.	Vet.	Ames	Story
Brown, Seth A.	E. E.	Manchester	Delaware
Brush, Geo.	E. E.	Traer	Tama
Buck, Allen P.	Vet.	Ames	Story
Buck, David	Agron.	Rhoades	Marshall
Buck, Floyd L.	Vet.	Ames	Story
Buckland, W. W.	A. H.	Ames	Story
Buckley, G. M.	Agrl.	Shelby	Shelby
Budan, M. B.	A. H.	Dubuque	Dubuque
Buffington, Clyde	A. H.	Glenwood	Mills
Burgen, Royal	E. E.	Spencer	Clay
Burgeson, J. A.	E. E.	Ames	Story
Burket, L. K.	E. E.	Hawarden	Sioux
Burling, Helen A.	G. & D. S.	Eldora	Hardin
Burlingame, J. H.	C. E.	Cherokee	Cherokee
Burright, J. B.	C. E.	Gravity	Taylor
Bushnell, J. A.	E. E.	Algona	Kossuth
Byam, C. A.	C. E.	Hubbard	Hardin
Calonkey, Olive	G. & D. S.	Woodward	Dallas
Cameron, Hurst M.	Vet.	Montezuma	Poweshiek
Cameron, Lucetta	G. & D. S.	Alta	Buena Vista
Cameron, Will	E. E.	Ames	Story
Campbell, Clarence C.	E. E.	Farragut	Fremont
Campbell, Donald	C. E.	Des Moines	Polk
Capper, Chas.	C. E.	Ames	Story
Casey, F. E.	Hort.	Mason City	Cerro Gordo
Chalmers, David	Vet.	Corning	Adams
Chapman, L. A.	Mn. E.	Storm Lake	Buena Vista

Chase, A. R.	Sci.	McIntire	Mitchell
Christianson, C. H.	E. E.	Story City	Story
Church, D.	A. H.	Hampton	Franklin
Clapper, Lyle	C. E.	Ames	Story
Clark, G. W.	E. E.	Cedar Rapids	Linn
Clemmer, H. F.	C. E.	Hampton	Franklin
Cockerell, Fred	C. E.	Harlan	Shelby
Colford, M. L.	M. E.	Ft Dodge	Webster
Colvin, R. C.	C. E.	Chariton	Lucas
Compton, Wroe	A. H.	Des Moines	Polk
Conger, Lana	G. & D. S.	Adel	Dallas
Conway, C. L.	C. E.	Hampton	Franklin
Cooley, C. H.	E. E.	Manchester	Delaware
Cooney, Maggie	D. S.	Oelwein	Fayette
Corlette, L. H.	E. E.	Ames	Story
Cort, E. G.	A. H.	Ames	Story
Cowan, H. C.	Mn. E.	Eagle Grove	Wright
Crandon, A. B.	A. H.	Gilman	Marshall
Crittenden, Florence	G. & D. S.	Humboldt	Humboldt
Crofoot, Frank	E. E.	Clinton	Clinton
Crow, H. O.	Mn. E.	Eldora	Hardin
Cupps, Ethel	G. & D. S.	Ames	Story
Currier, Harold	Vet.	Salix	Woodbury
Cutler, Frank	C. E.	Osage	Mitchell
Daly, C. C.	E. E.	Newton	Jasper
Darger, H. C.	A. H.	Sioux City	Woodbury
Dauchy, G. W.	E. E.	Waterloo	Black Hawk
Davidson, R. J.	A. H.	Brooklyn	Poweshiek
Davis, Floyd	A. H.	Villisca	Montgomery
Davis, Harry E.	C. E.	Hampton	Franklin
Davis, O. L.	C. E.	New Virginia	Warren
Day, E. L.	Dairy	Des Moines	Polk
Day, Roy M.	Agron.	Minneapolis	*Minnesota*
Deacon, Elizabeth	Sci.	Ames	Story
Dean, F. L.	E. E.	Ames	Story
Deemer, E. H.	A. H.	Des Moines	Polk
DeVault, G. G.	M. E.	Ames	Story
Dickey, W. N.	E. E.	Cedar Falls	Black Hawk
Dietz, Wm. E.	C. E.	Charles City	Floyd
Dockstader, Irvie	E. E.	Des Moines	Polk
Doerr, John	Vet.	Baxter	Jasper
Donovan, J. J.	Vet.	Zwingle	Jackson
Dornbach, Wm. E.	Cer.	McGregor	Clayton
Doty, Hiram	Sci.	Ames	Story
Doughty, L. H.	C. E.	Norfolk	*Nebraska*
Dowson, H. R.	M. E.	Columbus Jct.	Louisa
Drasda, F.	E. E.	Lyons	Clinton
Dreibelbis, J. H.	E. E.	Scotch Grove	Jones
Dunham, Florence	D. S.	Ames	Story
Eastwold, O. A.	E. E.	Le Roy	*Minnesota*
Edgecomb, Rex	C. E.	Missouri Valley	Harrison
Efnor, Guy M.	Agrl.	Monroe	Jasper
Eichling, H. L.	Agron.	Paulding	*Ohio*
Elayda, Inocencio	Agrl.	Iba	*Gambales, P. I.*
Elliott, W. R.	Vet.	Woodward	Dallas
Evans, E. L.	M. E.	Lynn Grove	Buena Vista
Farnsworth, Elizabeth	D. S.	Boone	Boone
Farnsworth, E. P.	A. H.	Avoca	Pottawattamie
Ferguson, Myrtle	G. & D. S.	Sioux City	Woodbury

Ferm, J. F.	M. E.	Lead	*So. Dakota*
Fiester, Arch	E. E	Independence	Buchanan
Fillis, B. E.	E. E.	Sutherland	O'Brien
Finch, A. D.	C. E.	West Union	Fayette
Fintel, A. R.	M. E.	Ames	Story
Fische, E. L.	E. E.	Shelby	Shelby
Fischer, Austin	C. E.	Glidden	Carroll
Fishel, H. B.	C. E.	Dow City	Crawford
Fitcher, Henry	C. E.	Madison Lake	*Minnesota*
Flack, Frank	E. E.	Perry	Dallas
Fobes, R. G.	A. H.	Marcus	Cherokee
Folknis, G. H.	M. E.	Ida Grove	Ida
Fox, Harry	Agrl.	Des Moines	Polk
Franklin, R. L.	C. E.	Des Moines	Polk
Freed, Oscar	Vet.	Ames	Story
Freed, W. J.	S. & A.	Ames	Story
Freeman, F. G.	Hort.	Winfield	Henry
Frevert, C. B.	M. E.	Odebolt	Sac
Fuller, J. M.	Agron.	Ames	Story
Furman, Addie	G. & D. S.	Webster City	Hamilton
Gardner, Chas. H.	Cer.	Fremont	*Nebraska*
Gardner, Miles	A. H.	Audubon	Audubon
Garton, H. L.	Agron.	Humeston	Wayne
Gibson, E. P.	E. E.	Harlan	Shelby
Gibson, F. W.	E. E.	Terril	Dickinson
Gillespie, Agnes	G. & D. S.	Spencer	Clay
Gilmore, Earl	Vet.	Nevada	Story
Gilmore, Wayne	E. E.	Des Moines	Polk
Gilseman, E. J.	C. E.	Ames	Story
Gobble, C. F.	A. H.	Fairfield	Jefferson
Gonzalez, Juan A.	Agron.	Monclova	*Coahiula, Mex.*
Good, H. F.	E. E	Emporia	*Kansas*
Goodin, Chas.	C. E.	Des Moines	Polk
Gooding, D. R.	M. E.	Wausau	*Wisconsin*
Goodrich, I. E.	C. E.	Waterloo	Black Hawk
Graham, Chas. H.	A. H.	Verona	*Pennsylvania*
Gratiot, Flint	M. E.	Shullsburg	*Wisconsin*
Gratiot, J. B.,	A. H,.	Shullsburg	*Wisconsin*
Gribben, Wm.	C. E.	Minburn	Dallas
Griffith, Guy	E. E.	Ames	Story
Haas, Franz	Agron.	Shelby	Shelby
Hahn, E. W.	E. E.	Whittemore	Kossuth
Hahn, Hugo	M. E.	Dyersville	Polk
Hakeman, Florence	D. S	Belle Plaine	Benton
Halverson, H. A.	C. E.	Kingsley	Plymouth
Hammil, W. J.	E. E.	Garden Grove	Decatur
Hammitt, Chas.,	E. E.,	Toledo	Tama
Hammond, F. B.	Agrl.	Moab	*Utah*
Hanchette, Ralph	C. E.	Sioux City	Woodbury
Handy, D. J.	A. H.	Grinnell	Poweshiek
Hanson, Bert	C. E.	Stacyville	Mitchell
Harpin, H. E.	Agron.	Creston	Union
Harris, Merton	M. E.	Perry	Dallas
Harrison, W. M.	E. E.	Sioux City	Woodbury
Harte, E. C.	M. E.	Omaha	*Nebraska*
Harter, Ira	M. E.	Sac City	Sac
Hartz, H. M.	Hort.	Davenport	Scott
Hatch, H. C.	E. E.	George	Lyon
Havner, H.	Vet.	Corydon	Wayne

Hawthorn, H. B.	Agron.	Castana	Monona
Hegdahl, Paul	C. E.	Madison	*So. Dakota*
Heiple, E. W.	C. E.	Waterloo	Black Hawk
Helm, Ralph	Agron.	Des Moines	Polk
Hemsworth, O. V.	E. E.	Cedar Falls	Black Hawk
Hendrix, W. C.	A. H.	Letts	Louisa
Henninger, Frank	C. E.	Council Bluffs	Pottawattamie
Herm, O. G.	C. E.	Scarville	Winnebago
Hershey, J. H.	S. & A.	Ames	Story
Hibner, Chas.	M. E.	Marion	Linn
Higley, F. M.	Hort.	Cedar Rapids	Linn
Hill, Frank W.	C. E.	Osage	Mitchell
Hintgen, L. N.	C. E.	Ashton	Osceola
Hise, F. H.	M. E.	Monroe	Jasper
Hoffman, Arthur	Hort.	Des Moines	Polk
Hoffman, G. C.	C. E.	Livermore	Humboldt
Hoggatt, E. H.	E. E.	Ames	Story
Holcombe, F. L.	A. H.	Southern Pines	*No. Carolina*
Holloway, G. N.	E. E.	Mason City	Cerro Gordo
Holmes, Clarence	E. E.	Boone	Boone
Honkomp, Chas.	C. E.	Ashton	Osceola
Horcasitas, Fernando	Agron.	Chihuahua	*Mexico*
Horcasitas, Pablo	A. H.	Chihuahua	*Mexico*
Horton, Guy	Mn. E.	Marion	Linn
Householder, Harold	Vet.	Chariton	Lucas
Howard, Allan	M. E.	Ft. Madison	Lee
Howard, J. H.	C. E.	Nashua	Chickasaw
Howd, O. O.	C. E.	Webster City	Hamilton
Howe, John	Agrl.	Council Bluffs	Pottawattamie
Hronek, F. J.	Vet.	Pocahontas	Pocahontas
Hudson, C. R.	E. E.	Schaller	Sac
Humphrey, Ray	E. E.	Howard	*So. Dakota*
Hurd, Ralph R.	C. E.	Williams	Hamilton
Hyde, Branham	E. E.	Des Moines	Polk
Hynes, B. C.	E. E.	Shenandoah	Page
Ingles, Ward	C. E.	Monticello	Jones
Inman, E. K.	E. E.	Smithland	Woodbury
Jacobsen, Robt.	E. E.	Atlantic	Cass
Jacques, R. E.	E. E.	Waterville	*Kansas*
Jansen, B.	C. E.	Alton	Sioux
Jay, D. A.	A. H.	Blakesburg	Wapello
Jensen, G. J.	E. E.	Maquoketa	Jackson
Johnson, Bernard	Vet.	Sweetwater	*Nebraska*
Johnson, Oscar J.	Vet.	Wheatland	*Wyoming*
Jones, Hodge	E. E.	Shenandoah	Page
Jones,Joseph	C. E.	Crawfordsville	Washington
Jones, Margaret	D. S.	Manchester	Delaware
Jones, R. Glenn	A. H.	Marion	Linn
Kamerer, N. C.,	M. E.,	Ft. Madison	Lee
Keeney, W. E.,	C. E.,	Jefferson	Greene
Kelley, J. B.,	E. E.,	Ames	Story
Kelley, Raymond,	E. E.,	Ames	Story
Kemp, McDonald,	Agron.,	Ardmore	*Pennsylvania*
Kenison, F. R.,	A. H.,	Madrid	Boone
Keniston, H. E.,	E. E.,	Hawarden	Sioux
Kennedy, R. B.,	Vet.,	Mason City	Cerro Gordo
Ketman, G. F.,	C. E.,	Humboldt	Humboldt
Kierulff, Karl,	E. E.,	Montezuma	Poweshiek
Killey, J. W.,	C. E.,	Geneva	*Illinois*

Kinyon, Chas.,	E. E.,	Newton	Jasper
Kitzhofer, J. H.,	Vet.,	New Hampton	Chickasaw
Klippel, F. H.,	E. E.,	Britt	Hancock
Knowles, Wm.,	M. E.,	Council Bluffs	Pottawattamie
Knox, R. R.,	E. E.,	Marcus	Cherokee
Kyner, Roy	Vet.,	Humeston	Wayne
Lacey, Sumner E.,	E. E.,	Council Bluffs	Pottawattamie
Laing, Frank,	E. E.,	Grinnell	Poweshiek
Laird, W. Ray,	Vet.,	Algona	Kossuth
Lake, Carrie,	G. & D. S.,	Gilbert Station	Story
Lake, C. C.,	A. H.,	Gilbert Station	Story
Lamb, Eleanor,	D. S.,	Ridott	*Illinois*
Lambert, Millard	A. H.,	Colusa	*Illinois*
Lamson, J. B.,	A. H.,	Fairfield	Jefferson
La Sourd, G. M.,	M. E.,	Woodbine	Harrison
Lattimer, B. J.,	Vet.,	Bancroft	Kossuth
Leavens, Adeline,	D. S.,	Shellrock	Butler
Leerberg, N.,	M. E.,	Marshalltown	Marshall
Leigh, Helen,	D. S.,	Clearfield	Taylor
Lemen, Minor,	Vet.,	Northwood	Worth
Lemmon, G. R.,	C. E.,	Atlantic	Cass
Letts, Warren,	A. H.,	Columbus Jct.	Louisa
Linse, J. F.,	Vet.,	Lamoni	Decatur
Littlejohn, R. O.,	E. E.,	Independence	Buchanan
Lockwood, Claire,	G. & D. S.,	Nevada	Story
Lorenzo, Tomas,	E. E.,	San Fernando	*Pampanga, P. I.*
Lovesee, R. G.,	Vet.,	Storm Lake	Buena Vista
Luney, E. A.,	E. E.,	Denison	Crawford
Madsen, Sern,	M. E.,	Forest City	Winnebago
Maine, Harry E.,	Mn. E.,	Des Moines	Polk
Malloy, J. M.,	C. E.,	Davenport	Scott
Maney, Thos.,	Hort.,	Geneva	*New York*
Mann, F. D.,	Agron.,	Castana	Monona
Mann, W. G.,	E. E.,	Lake Benton	*Minnesota*
Martin, E. R.,	E. E.,	Wayland	Washington
Mayhew, Harry	A. H.,	Villisca	Montgomery
Mellor, Bessie	G. & D. S.,	Ames	Story
Mercer, F. H.,	A. H.,	Elliott	Montgomery
Merrill, A. H.,	C. E.,	Livermore	Humboldt
Michaelson, Thorwald,	C. E.,	Cedar Falls	Black Hawk
Michaelson, W. M.,	C. E.,	Gilbert	Story
Middleton, R. S.,	Agron.,	Minerva	Marshall
Miller, P. E.,	A. H.,	Cedar Rapids	Linn
Miller, Ralph H.,	Sci.,	Mitchell	*So. Dakota*
Minert, J. Willard,	E. E.,	Waukon	Allamakee
Mobley, B.,	E. E.,	Oskaloosa	Mahaska
Moriarity, C.,	C. E.,	Redfield	*So. Dakota*
Morris, F. H.,	M. E.,	Corning	Adams
Morse, Wallace,	A. H.,	Ames	Story
Mosbo, Edward	A. H.,	Rembrandt	Buena Vista
Moses, T. R.,	Agron.,	Oak Park	*Illinois*
Mosher, Clark,	C. E.,	West Liberty	Muscatine
Mosley, F. R.,	M. E,.	Des Moines	Polk
Moss, V. W.,	E. E.,	Albia	Monroe
Muir, Harry,	Mn. E.,	Ames	Story
Musgrove, F. B.,	M. E.,	Ames	Story
Muxen, Matthew,	A. H.,	Redfield	*So. Dakota*
McBirney, H. R.,	C. E.,	Conrad	Grundy
McCartney, H. E.,	A. H.,	Geneva	*Nebraska*

McCord, Bradley,	Agron.,	Harlan	Shelby
McCoy, Edwin,	E. E.,	Creston	Union
McCulloch, H.,	Vet.,	Humeston	Wayne
McCullough, C. B.,	C. E.,	Ft. Dodge	Webster
McCune, Chas. E.,	E. E.,	Davenport	Scott
McDonald, B. F.,	Vet.,	Mitchellville	Polk
McDonald, C. M.,	C. E.,	Montezuma	Poweshiek
McDonald, May,	D. S.,	Jewell	Hamilton
McDonald, Montgomery,	E. E.,	Lamoni	Decatur
McElroy, Margaret,	Sci.,	Newton	Jasper
McElyea, L. W.,	Vet.,	Ames	Story
McEwen, P. H.,	E. E.,	Plover	Pocahontas
McGavern, Ward,	M. E.,	Missouri Valley	Harrison
McKenzie, J. H.,	C. E.,	Elwood	Clinton
McMillan, J. G.,	Agron.,	Vinton	Benton
McMillan, L. E.,	A. H.,	Vinton	Benton
McRoberts, Hilton,	Vet.,	Columbus City	Louisa
Naiden, J. H.,	M. E.,	Woodward	Dallas
Narvis, Stewart,	M. E.,	Muscatine	Muscatine
Naylor, Joe,	A. H.,	Clear Lake	Cerro Gordo
Nelson, A. E.,	A. H.,	Harlan	Shelby
Nelson, N. L.,	Vet.,	Algona	Kossuth
Newell, Thomas,	C. E.,	Columbus Jct.	Louisa
Nicholson, H. L.,	E. E.,	Belle Plaine	Benton
Nielson, A. R.,	Vet.,	Ames	Story
Noble, G. L.,	Dairy,	State Center	Marshall
Noble, W. H.,	E. E.,	Graettinger	Palo Alto
Noland, W. S.,	A. H.,	Columbus Jct.	Louisa
Olmstead, H. H.,	C. E.,	New Hampton	Chickasaw
Osborn, Howard,	A. H.,	Perry	Dallas
Otis, R. R.,	C. E.,	Council Bluffs	Pottawattamie
Otto, I. R.,	C. E.,	Osage	Mitchell
Overly, F. L.,	Hort.,	Indianola	Warren
Page, J. Y.,	C. E.,	Charles City	Floyd
Palmer, B. L.,	E. E.,	Algona	Kossuth
Palmer, D. B.,	Vet.,	Cedar Rapids	Linn
Palmer, E. M.,	C. E.,	Mason City	Cerro Gordo
Palmer, R. C.,	A. H.,	Eddyville	Wapello
Pammel, Harriet,	D. S.,	Ames	Story
Parke, L. S.,	Hort.,	Paullina	O'Brien
Parker, B. L.,	E. E.,	Moscow	Muscatine
Paulson, H. J.,	E. E.,	Avoca	Pottawattamie
Paxton, Winter,	Vet.,	Ames	Story
Pence, Clay,	E. E.,	Howard	*So. Dakota*
Peoples, R. A.,	Vet.,	Woodward	Dallas
Perry, E. J.,	C. E.,	Marshalltown	Marshall
Perry, G. G.,	E. E.,	Sioux City	Woodbury
Peters, C. H.,	E. E.,	Grinnell	Poweshiek
Peterson, G. E.,	C. E.,	Harlan	Shelby
Pinney, F. W.,	Mn. E.,	Humboldt	Humboldt
Platts, Chas.,	A. H.,	Lake Mills	Winnebago
Porter, C. H.,	A. H.,	Davenport	Scott
Porter, Ethel,	G. & D. S.,	Centerville	Appanoose
Porter, Lawrence,	C. E.,	Cedar Falls	Black Hawk
Porter, Mernie,	G. & D. S.,	Centerville	Appanoose
Porterfield, Ray,	Vet.,	Hartley	O'Brien
Priester, H. C.,	E. E.,	Davenport	Scott
Pusch, G. W.,	M. E.,	Tuscon	*Arizona*
Quinn, J. F.,	E. E.,	Grand Mound	Clinton

Quint, Annie L.,	Sci.,	Des Moines	Polk
Raasch, F. A.,	E. E.,	Rockford	Floyd
Racine, F. W.,	Hort.,	Ottumwa	Wapello
Radcliff, Stewart,	E. E.,	Howard	*So. Dakota*
Ravlin, Mary,	D. S.,	Ames	Story
Rector, J. U.,	A. H.,	Oneida	Delaware
Reed, C. L.,	Sci.,	Bradford	*Illinois*
Reese, Ernest,	C. E.,	Hubbard	Hardin
Reis, R. B.,	M. E.,	Ames	Story
Renne, J. D.,	M. E,.	Eagle Grove	Wright
Reynoldson, L. A.,	Hort.,	Primghar	O'Brien
Rice, Dora,	D. S.,	Ames	Story
Richards, F. A.,	M. E.,	Onawa	Monona
Richardson, R. E.,	C. E.,	Armstrong	Emmet
Ricketts, R. A.,	Vet.,	Nevada	Story
Robertson, C.,	C. E.,	New Sharon	Mahaska
Robertson, J. J.,	C. E.,	Columbus Jct.	Louisa
Rogers, Harold,	C. E.,	Toledo	Tama
Rohrer, D. E.,	C. E.,	Joplin	*Missouri*
Roland, A. A.,	C. E.,	Ames	Story
Rolston, J. E.,	E. E.,	Conrad	Grundy
Root, Walter,	C. E.,	Des Moines	Polk
Ross, F. M.,	Vet.,	Boone	Boone
Rowat, David,	A. H.,	Des Moines	Polk
Rudd, J. H.,	Agron.,	Cedar Rapids	Linn
Rudnick, A. W.,	Dairy,	Chicago	*Illinois*
Rush, Gladys,	G. & D. S.,	Colfax	Jasper
Russell, Leta,	G. & D. S.,	Humboldt	Humboldt
Russell, W. H. C.,	E. E.,	Milton	Van Buren
Saberson, Lulu,	G. & D. S.,	Des Moines	Polk
Sauerberg, C. G.,	M. E.,	Mason City	Cerro Gordo
Sawyer, Clyde,	E. E.,	Howard	*So. Dakota*
Schader, F. M.,	C. E.,	Preston	Jackson
Schafer, C. W.,	C. E.,	Grinnell	Poweshiek
Schmitt, W. W.,	Agron.,	Niagara Falls	*New York*
Schnaidt, H. A.,	A. H.,	Menno	*So. Dakota*
Schoel, Fred,	C. E.,	Gladbrook	Tama
Schoenenberger, J. G.,	Vet.,	East Peru	Madison
Scholfield, Mark,	A. H.,	Wausau	*Wisconsin*
Scholten, H. M.,	C. E.,	Alton	Sioux
Schregardus, Dirk,	E. E.,	Prairie City	Jasper
Scott, F. A.,	Vet.,	Ontario	Story
Scott, Grace R.,	D. S.,	Griswold	Cass
Scriver, S. A.,	A. H.,	Denison	Crawford
Searle, Jessie,	Hort.,	Nemaha	Pottawattamie
Searle, Mary,	D. S.,	Nemaha	Pottawattamie
Secor, P. R.,	A. H.,	Melbourne	Marshall
Seeburger, K. D.,	M. E.,	Newton	Jasper
Seeley, F. M.,	M. E.,	Biwabik	*Minnesota*
Sharp, Glenn,	Vet.,	Montezuma	Poweshiek
Shields, E. F.,	Mn. E.,	Ames	Story
Shields, Fred,	A. H.,	Villisca	Montgomery
Shupe, M. W.,	E. E.,	Elm Creek	*Nebraska*
Simmons, Paul,	C. E.,	Osceola	Clark
Simms, W. H.,	M. E.,	Beaman	Grundy
Sine, Harry,	C. E.,	Waterloo	Black Hawk
Slaughter, H. L.,	E. E.,	Waterloo	Black Hawk
Slaughter, Raymond,	C. E.,	Waterloo	Black Hawk
Smith, M. W.,	C. E.,	Shenandoah	Page

Smith, Will A.,	E. E.,	Reinbeck	Grundy
Smith, Wm. A.,	C. E.,	Roxbury	*New York*
Snow, H. A.,	E. E.,	Blakesburg	Wapello
Souers, H. C.,	C. E.,	Des Moines	Polk
Spethmann, W. A.,	E. E.,	Omaha	*Nebraska*
Squyer, A. R.,	E. E.,	Ames	Story
Stafford, R. R.,	E. E.,	Blairsburg	Hamilton
Stapp, J. J.,	A. H.,	Columbus Jct.	Louisa
Stearns, Harvey,	M. E.,	Sutherland	O'Brien
Stauffer, Madeline,	G. & D. S.,	Eldon	Wapello
Steel, B. W.,	C. E.,	Winterset	Madison
Stephens, Marie	G. & D. S.	Lohrville	Calhoun
Stevens, Wayne	Agron.	Des Moines	Polk
Steinman, L.	Agron.	Cresco	Howard
Stewart, B. A.	S. & A.	Marshalltown	Marshall
Stewart, H. M.	A. H.	Ainsworth	Washington
Stewart, J. E.,	C. E.,	Agency	Wapello
Stirling, G. C.	M. E.	Des Moines	Polk
Stoddard, I. W.	C. E.	Muscatine	Muscatine
Stone, H. B.	A. H.	Knoxville	Marion
Stork, V. H.	E. E.	Garner	Hancock
Storm, Shirley S.	D. S.	Ames	Story
Strickler, E. F.	C. E.	Centerville	Appanoose
Stuart, Hoadley	C. E.	Glidden	Carroll
Stuart, Leo	C. E.	Walnut	Pottawattamie
Stull, Merwyn	E. E.	Oskaloosa	Mahaska
Suksdorf, C. R.	M. E.	Davenport	Scott
Sullivan, M. E.	Vet.	Story City	Story
Sutherland, L. D.	C. E.	Scotch Grove	Jones
Taylor, Harvey	M. E.	Ames	Story
Taylor, R. A.	Mn. E.	Jacksonville	*Florida*
Tellier, Emma	G. & D. S.	Humboldt	Humboldt
Thomas, M. M.	A. H.	Riverside	*California*
Thomas, Roscoe M.	M. E.	North English	Iowa
Thompson, Walter	Vet.	Hills	*Minnesota*
Thomson, Percy	M. E.	Cresco	Howard
Tidrick, L. F.	Cer.	Des Moines	Polk
Todd, F. J.	M. E.	Cresco	Howard
Tompkins, W. I.	E. E.	Garrison	Benton
Toms, R.	E. E.	Marion	Linn
Trimble, C. E.	Dairy	Alden	Hardin
Trullinger, S. B.	Dairy	Farragut	Fremont
Tudor, J. M.	A. H.	Iowa City	Johnson
Turner, Harold	C. E.	St. Ansgar	Mitchell
Tyler, H. E.	M. E.	Villisca	Montgomery
Tyson, H. B.	Mn. E.	Emmetsburg	Palo Alto
Vail, Glen B	E. E.	Garden Grove	Decatur
Vail, Howard	A. H.	Nevada	Story
Van Auken, E.	Mn. E.	Ames	Story
Van Eizenga, J. J.	C. E.	Orange City	Sioux
Vansickle, R. S.	Vet.	Indianola	Warren
Van Sise, A. J.	Mn. E.	Ames	Story
Vaughn, Howard	A. H.	Marion	Linn
Velie, Carleton	E. E.	Sanborn	O'Brien
Vogel, W. B.	C. E.	Malcolm	Poweshiek
Vorse, Chas.	C. E.	Des Moines	Polk
Wakeman, R. P.	E. E.	Ft. Dodge	Webster
Walker, B. A.	C. E.	Des Moines	Polk
Wallace, Marie	D. S.	Mendota	*Illinois*

Walleser, E. L.	E. E.	Nashua	Chickasaw
Walraven, John	E. E.	Lyons	Clinton
Walters, Leslie	Agrl.	Glidden	Carroll
Warkley, J. C.	C. E.	Cheyenne	*Wyoming*
Warner, C. P.	M. E.	Muscatine	Muscatine
Watson, Wallace	C. E.	Greene	Butler
Webster, C. H.	E. E.	Eagle Grove	Wright
Weiss, Albert	A. H.	Denison	Crawford
Welden, Ernest	C. E.	Iowa Falls	Hardin
Wells, Paul	E. E.	Des Moines	Polk
Wentsel, Claude	M. E.	Beamen	Grundy
West, R. J.	E. E.	Colfax	Jasper
Westfall, Vere	E. E.	Ames	Story
Whitaker, W. S.	E. E.	Hillsboro	Henry
Whitham, J. Campbell	Agrl.	Fairfield	Jefferson
Whitmer, Ray	Vet.	Kingsley	Plymouth
Whittemore, Ruth	D. S.	Sioux City	Woodbury
Wichman, Geo.	E. E.	Atlantic	Cass
Wilbur, W. E.,	C. E.	Omaha	*Nebraska*
Wilcox, E. A.	E. E.	Vinton	Benton
Willett, T. K.	Mn. E.	Decorah	Winneshiek
Willey, L. E.	Vet.	Ames	Story
Williams, Geo.	C. E.	Ft. Dodge	Webster
Wilson, Velda	Sci.	Sigourney	Keokuk
Witwer, Polly	D. S.	Cedar Rapids	Linn
Woodford, L. G.	Mn. E.	Council Bluffs	Pottawattamie
Woody, C. C.	C. E.	Newton	Jasper
Worley, F. E.	E. E.	Burlington	Lee
Wormley, Don	E. E.	Newton	Jasper
Wright, A. C.	E. E.	Adel	Dallas
Wylie, Paul E.	Mn. E.	Des Moines	Polk
Zellweger, J. H.	M. E.	Tuscon	*Arizona*
Zentmire, D.	A. H.	Ames	Story
Zentmire, Zelma	Sci.	Ames	Story
Zerbe, G. M.	C. E.	Nevada	Story

ACADEMIC.

NAME	COURSE	TOWN	COUNTY
Adams, O. E.	E. E.	Smithland	Woodbury
Ageton, Roy	Mn. E.	Ames	Story
Allen, H. J.	E. E.	Creston	Union
Ames, John	A. H.	Conrad	Grundy
Anderson, Merle	A. H.	Jewell	Hamilton
Anwyl, N. B.	Agrl.	Columbus Jct.	Louisa
Arentson, James	M. E.	Harlan	Shelby
Ashby, H. P.	Agron.	Creston	Union
Ayres, A. Owen	E. E.	Sheldon	O'Brien
Ayres, Warren	C. E.	Sheldon	O'Brien
Babcock, L. L.	M. E.	Owaso	Hardin
Bailleres, Jose	M. E.	Leon	*Mexico*
Bakewell, A. A.	Hort.	Pittsburg	*Pennsylvania*
Baldwin, E. M.	C. E.	Creston	Union
Barhite, B. B.	C. E.	Ames	Story
Bauer, F. F.	A. H.	Millersburg	Iowa
Baxter, R. B.	A. H.	Galva	Ida
Beach, C. S.	A. H.	Lenox	Taylor
Beeler, C. F.	Mn. E.	Cleveland	*Ohio*
Bell, E. M.	A. H.	Wiota	Cass

Benn, Ray	E. E.	Dyersville	Dubuque
Bennett, H. M.	E. E.	Webster City	Hamilton
Benson, D. R.	E. E.	Diagonal	Ringgold
Bigelow, H. T.	E. E.	Waukon	Allamakee
Biller, Minnie	G. & D. S.	Hartington	*Nebraska*
Blatherwick, Dirwyn	Hort.	Marshalltown	Marshall
Boden, F. O.	C. E.,	Ames	Story
Bonsteel, M.	M. E.	Ames	Story
Booth, Lester	M. E.	Bonaparte	Van Buren
Bouricius, G. J.	E. E.	Council Bluffs	Pottawattamie
Bowen, T. J.	C. E.	Nashua	Chickasaw
Boyce, S. H.	C. E.	Cedar Rapids	Linn
Brant, W. O.	E. E.	Meriden	Cherokee
Brecht, Clarence	M. E.	Des Moines	Polk
Brooks, E. C.	E. E.	Wiota	Cass
Brown, John C.	E. E.	Chatsworth	*Illinois*
Brown, J. Lloyd	C. E.	New Providence	Hardin
Brumhall, J. H.	E. E.	Armstrong	Emmet
Bryan, W. J.	C. E.	Bentonville	*Arkansas*
Buhler, E. O.	Cer.	Vail	Crawford
Burnett, L. E.	A. H.	Galesburg	*Illinois*
Butterworth, Hugh	C. E.	Dow City	Crawford
Carr, Marie	D. S.	Columbus Jct.	Louisa
Cartwright, C. E.	E. E.	Creston	Grundy
Chamberlain, A. L.	E. E.	Des Moines	Polk
Chandler, C. W.	A. H.	Kellerton	Ringgold
Chapman, E. A.	Sci.	Randolph	*Nebraska*
Chase, Flora	Sci.	McIntire	Mitchell
Clark, R. J.	E. E.	Dakota City	Humboldt
Cole, Edith	G. & D. S.	Ames	Story
Cole, W. H.	E. E.	Williams	Hamilton
Corbalan, Patricio	A. H.	Salta State	*Argentine Rep.*
Conaway, G. C.	E. E.,	Moville	Woodbury
Cooley, Fred	Agrl.	Osceola	Clark
Corray, L. E.	C. E.	Monroe	Jasper
Cottrill, Frank	C. E.	Ames	Story
Craft, Ira	C. E.	Zearing	Story
Craig, Carson	C. E.	Moulton	Appanoose
Cratty, R. W.	E. E.	Armstrong	Emmet
Creel, S.	Agron.	Chihuahua	*Mexico*
Crouch, L. G.	C. E.	Ulmer	Sac
Dahlby, I. E.	A. H.	Joyce	Worth
Dalbey, D. E.	Mn. E.	Cedar Rapids	Linn
Darbyshire, Glen	A. H.	Shannon City	Union
Deakin, Helen	G. & D. S.	Ames	Story
Deemer, Elizabeth	G. & D. S.	Des Moines	Polk
Deischer, Harold	A. H.	Monticello	Jones
De Klotz, Fanny	Sci.	Kirkman	Shelby
De Mots, E. G.	E. E.	Sioux Center	Sioux
De Vault, Lois	D. S.	Ames	Story
Dewey, Wm. A.	C. E.	Milford	Dickinson
Dodd, L. R.	E. E.	Moville	Woodbury
Doggett, A. E.	A. H.	Ames	Story
Doty, Katie	Sci.	Ames	Story
Doty, Lewis	Dairy	Ames	Story
Drake, Wm. B.	M. E.	Ames	Story
Duncan, Harland	A. H.	Alexis	*Illinois*
Dunlop, A. N.	A. H.	Ft. Dodge	Webster
Dunning, Mildred	G. & D. S.	Ames	Story

Eder, E. O.	C. E.	Estherville	Emmet
Edwards, Edgar	C. E.	Williams	Hamilton
Elliott, R. C.	E. E.	Lewis	Cass
Emerson, J. G.	E. E.	Burchinal	Cerro Gordo
English, James	A. H.	Villisca	Montgomery
Fagan, H. J.	E. E.	Mt. Auburn	Benton
Ferriols, Vicente	S. & A.	San Marcetino,	*Zambales, P. I.*
Ford, L. M.	M. E.	Cedar Rapids	Linn
Foster, C. A.	C. E.	Ames	Story
Frandson, Hulda	Sci.	Story City	Story
Frasche, Beatrice	D. S.	Boone	Boone
Frazey, Harry	E. E.	Shelby	Shelby
Fuchs, Iva	G. & D. S.	Wall Lake	Sac
Fujimore, I.	E. E.	Swa Nagano	*Japan*
Gaden, Henry	C. E.	Remsen	Plymouth
Gibson, A. D.	E. E.	Ames	Story
Gilchrist, J. H.	C. E.	Ames	Story
Gring, Robt.	Agrl.	Storm Lake	Buena Vista
Hall, Allen	E. E.	Des Moines	Polk
Hamilton, Geo.	A. H.	Douglass	*Wyoming*
Hamilton, L. S.	E. E.	Central City	Linn
Hanson, Marie	G. & D. S.	Glidden	Carroll
Hartnell, Fred	A. H.	Stacyville	Mitchell
Hartung, A. E.	E. E.	Estherville	Emmet
Hatch, F. E.	A. H.	Sumner	Bremer
Heaton, R. D.	Mn. E.	Perry	Dallas
Hicks, R. R.	M. E.	Des Moines	Polk
Hill, F. A.	M. E.	Rectory	*Virginia*
Holloway, Grace	Sci.	Ames	Story
Horton, Floyd	M. E.	Ames	Story
Hoskins, G. G.	E. E.	Pacific Jct.	Mills
Howard, Leon	M. E.	Gladbrook	Tama
Hutcheson, C. R.	A. H.	West Branch	Cedar
Hutchison, W. E.	C. E.	Dawson	Dallas
Iker, Don	A. H.	Blanchard	Page
Jenks, L. L.	E. E.	Lamont	Buchanan
Johnson, Frank B.	E. E.	Wall Lake	Sac
Kane, Frank A.	E. E.	Marshalltown	Marshall
Kemp, Ward E.	Agrl.	Ames	Story
Kenny, Claude R.	C. E.	Early	Sac
Kinnebrew, Dude	A. H.	Corsicana	*Texas*
Kleis, L. E.	C. E.	Dubuque	Dubuque
Knickerbocker, James	C. E.	Radcliffe	Hardin
Knutz, Will	E. E.	Moville	Woodbury
Koepke, Wm.	Hort.	Davenport	Scott
Krause, F. E.	Agron.	Ionia	Chickasaw
Layman, C. C.	A. H.	Ames	Story
Leonard, E. A.	A. H.	Creston	Union
Long, F. R.	A. H.	Marne	Cass
Lowry, Laura	G. & D. S.	Jewell	Hamilton
Mac Kenzie, C. R.	C. E.	Boston	*Massachusetts*
Maine, F. S.	E. E.	Emerson	Mills
Mammel, L. J.	M. E.	Ames	Story
Mananton, Gregorio	Agron.	Arrayo	*Porto Rico*
Marshall, C. T.	A. H.	Charter Oak	Crawford
Martinson, W.	C. E.	Harlan	Shelby
Mattoon, Leslie	C. E.	Elgin	Fayette
Melberg, Amos	C. E.	Norway	Benton
Meneray, A. O.	Mn. E.	Council Bluffs	Pottawattamie

Meredith, Belle	G. & D. S.	Marne	Cass
Metz, C. A.	Mn. E.	Knoxville	Marion
Miller, C. C.	E. E.	Renwick	Humboldt
Minkler, H. L.	A. H.	Nevada	Story
Moffitt, Lewis	A. H.	Newton	Jasper
Moore, E. J.	C. E.	Cedar Rapids	Linn
Morris, Jesse	E. E.	Lohrville	Calhoun
Morse, Claire	A. H.	Ames	Story
Mould, H. E.	E. E.	Sioux City	Woodbury
Mueller, W. G.	C. E.	Camanche	Clinton
McBeath, Verna	Sci.	Whiting	Monona
McBurney, Eva	D. S.	Ames	Story
McCrory, R. R.	Agrl.	Ames	Story
McDonald, Cecil	M. E.	Jewell	Hamilton
McGrew, Melvin	A. H.	Emerson	Mills
Neil, J. E.	A. H.	Long Grove	Scott
Nelson, E. N.	E. E.	Roland	Story
Noble, G. K.	A. H.	Riceville	Mitchell
Odekirk, Elmore	C. E.	Fayette	Fayette
Olsen, James	C. E.	Williams	Hamilton
Parke, Madge	D. S.	Paullina	O'Brien
Parmenter, Glee	A. H.	Grimes	Polk
Paterson, Jas.	E. E.	Marshalltown	Marshall
Patten, Arthur	E. E.	Adair	Adair
Phillips, F. E.	C. E.	Lewis	Cass
Pollock, R. C.	C. E.	Martinsburg	Keokuk
Powers, Lauriel	D. S.	Rockwell City	Calhoun
Pratt, F. L.	E. E.	Burt	Kossuth
Pulver, C. W.	C. E.	Ames	Story
Quaife, E. L.	A. H.	Ionia	Chickasaw
Quirk, Archie	Sci.	Wall Lake	Sac
Rankin, W. N.	A. H.	Tarkio	*Missouri*
Ream, G. C.	M. E.	Broken Bow	*Nebraska*
Reeves, Will	C. E.	Livermore	Humboldt
Ries, S. L.	Sci.	Armstrong	Emmet
Robinson, Clara	D. S.	Armstrong	Emmet
Roddy, John	E. E.	Cedar Rapids	Linn
Rohrer, W. H.	Sci.	Melbourne	Marshall
Rowe, S. S.	C. E.	Olympia	*Washington*
Sanborn, G. C.	Mn. E.	Moville	Woodbury
Sanford, R. H.	Hort.	Marshalltown	Marshall
Searle, Wellington	A. H.	Nemaha	Pottawattamie
Seba, H.	E. E.	Monticello	Jones
Shanley, Adrian	E. E.	Mansfield	*So. Dakota*
Shaw, Don B.	C. E.	Monroe	Jasper
Siggers, P. V.	Hort.	Washington	*D. C.*
Silver, Frank	A. H.	Cantril	Van Buren
Skellie, R. E.	C. E.	Larrabee	Cherokee
Skinner, Schuyler	Agrl.	Westfield	*New York*
Smith, Fae E.	E. E.	Ames	Story
Smith, Grace	D. S.	Ames	Story
Smith, Jesse	M. E.	Rock Valley	Sioux
Snakenberg, Clifford	E. E.	Webster	Hamilton
Stearns, Wm. B.	A. H.,	Webster City	Hamilton
Steigleder, C. J.	C. E.	Spencer	Clay
Stephenson, J. L.	C. E.	Spencer	Clay
Stevens, Thad	A. H.	Boone	Boone
Stillwagon, Geo.	M. E.	Victor	Iowa
Storm, Van M.	Agrl.	Rockwell City	Calhoun

Storrs, Herman	E. E.	Hawarden	Sioux
Stoulil, W. G.	C. E.	Pocahontas	Pocahontas
Strever, H. W.	C. E.	Larrabee	Cherokee
Stover, E. R.	E. E.,	Newton	Jasper
Sutherland, H. B.	A. H.	Ames	Story
Stuart, Hazel	Sci.	Armstrong	Emmet
Taylor, B. L.	C. E.	Ames	Story
Templeton, W. J.	E. E.	Sioux City	Woodbury
Thornton, F. B.	E. E.	Pocahontas	Pocahontas
Tolstrup, M. R.	Dairy	Ames	Story
Tow, Emmett	C. E.	Norway	Benton
Tunnell, J. T.	E. E.	Mystic	Appanoose
Van Diepen, Jake	E. E.	Boyden	Sioux
Vore, Marion	C. E.	West Branch	Cedar
Wagner, Kenneth	C. E.	Cedar Rapids	Linn
Wales, Victor	A. H.	Sioux City	Woodbury
Watson, Will	Agrl.	Rock Rapids	Lyon
Wellman, W. H.	C. E.	Monona	Clayton
Wells, C. J.	E. E.	Ireton	Sioux
Wentsel, C. E.	E. E.,	Beamen	Grundv
Weston, Boyd	E. E.	Ames	Story
Wheatley, Chas.	E. E.	Hillsboro	Henry
Wilcox, Frank	E. E.	Minburn	Dallas
Wiley, Austin	A. H.	Albion	Marshall
Wiley, Otto E.	M. E.	Malcolm	Poweshiek
Wiley, Wm.	C. E.	Cedar Rapids	Linn
Wilfong, L. J.	E. E.	Mason City	Cerro Gordo
Wilson, I. D.	Agron.	Rockwell City	Calhoun
Wilson, J. G.	Dairy	Marshalltown	Marshall
Wilson, R. D.	E. E.	Hull	Sioux
Winchell, J. I.	M. E.	Anita	Cass
Woodman, Arthur	C. E.	Russell	Lucas
Wray, S. S.	C. E.	Bloomfield	Davis
Youngdale, Martin	A. H.	Harcourt	Webster
Zenor, V. M.	E. E.	Jewell	Hamilton

SPECIAL.

NAME	COURSE	TOWN	COUNTY
Ahlff, Vera Prime	G. & D. S.	Ames	Story
Anderson, Arthur G.	M. E.	Des Moines	Polk
Archer, Gladys	D. S.	Archer	O'Brien
Athanassion, Basil	Agron.	Bolgrad	*Russia*
Barber, Phineas R.	A. H.	Orman	*So. Dakota*
Barker, Edna	Sci.	Ames	Story
Barker, Hattie	Sci.	Ames	Story
Barnhart, J. C.	A. H.	West Branch	Cedar
Barr, Mrs. Marian	D. S.	Clinton	Clinton
Bass, W. T.	Agrl.	Waukee	Dallas
Batson, W. J.	A. H.	Spencer	Clay
Beckwith, Warren	A. H.	Ames	Story
Beede, Lillian B.	Sci.	Ames	Story
Benjamin, Leona	D. S.	Newton	Jasper
Besack, Jessie	D. S.	Newton	Jasper
Blanchard, F. T.	Agron.	Albion	Marshall
Blodgett, Mary	D. S.	Mt. Pleasant	Henry
Bond, A. R.	Agron.	Lamont	Buchanan
Bonner, R. A.	A. H.	Jewell	Hamilton
Bornholdt, Newton	M. E.	Davenport	Scott

Brobiel, Louis	M. E.	Ankeny	Polk
Brown, Arthur	A. H.	Turkey River	Clayton
Brown, C. H.	Agrl.	Galesburg	*Illinois*
Brown, J. Leroy	A. H.	Wyoming	*Illinois*
Brown, Lola	Sci.	Ames	Story
Brugger, Gus	A. H.	Lake City	Calhoun
Burch, B. F.	C. E.	Des Moines	Polk
Burnstedt, Albert	A. H.	Dudley	Wapello
Butterfield, W. S.	A. H.	Norfolk	*Nebraska*
Byers, Jessamine	Sci.	Colo	Story
Carlsen, Elise	G. & D. S.	St. Ansgar	Mitchell
Caulkins, E. A.	Hort.	Storm Lake	Buena Vista
Chapman, T. C.	Mn. E.	Albia	Monroe
Cleghorn, Frances	G. & D. S.	Onawa	Monona
Clure, Stella	D. S.	Des Moines	Polk
Cosgriff, H. C.	A. H.	Clarence	Cedar
Coy, J. H.	Agron.	Odebolt	Sac
Crabb, Morton	A. H.	Eminence	*Kentucky*
Culp, Opal	Sci.	Ames	Story
Cutter, Marian	D. S.	Ames	Story
Dale, A. C.	C. E.	Boone	Boone
Daniels, Craig	Agron.	Moulton	Appanoose
Day, Edna	D. S.	Keosauqua	Van Buren
Dewey, A. O.	A. H.	Murray	Clarke
Dinsmore, J. B.	A. H.	Ames	Story
Dixon, G. H.	Hort.	Stuart	Guthrie
Doolittle, Winifred	G. & D. S.	Ames	Story
Drury, M. W.	Agron.	Wall Lake	Sac
Dubes, C. C.	A. H.	Cherokee	Cherokee
Du Val, E. C.	M. E.	Hastings	Mills
Easter, Mary	D. S.	Bonaparte	Van Buren
Engberg, J. A.	C. E.	Kiron	Crawford
Enright, Will	A. H.	El Paso	*Illinois*
Erickson, G. E.	Agrl.	Lanyon	Webster
Erickson, R. S.	Agrl.	Lanyon	Webster
Fedderson, M. H.	A. H.	Bryant	Clinton
Fey, Fred	Mn. E.	Burlington	Des Moines
Fleming, Mabel	G. & D. S.	Ames	Story
Flint, Helen M.	D. S.	Ames	Story
Frandson, Albert	A. H.	Story City	Story
Franz, Henry	A. H.	Avoca	Pottawattamie
Friday, Richard C. W.	C. E.	Sigourney	Keokuk
Fruin, J. L.	A. H.	El Paso	*Illinois*
Frost, L.	Agron.	Avoca	Pottawattamie
Fuchs, O. C.	A. H.	Odebolt	Sac
Gillmore, S. G.	A. H.	Dixon	Scott
Godoy, J. C.	Hort.	Bella Vista F. C.P.,	*Arg. Republic*
Gray, Emily	Sci.	Ames	Story
Gregg, R. M.	A. H.	Hawarden	Sioux
Griffith, Bessie	G. & D. S.	Ames	Story
Griffith, W. A.	C. E.	West Point	Lee
Guthrie, Wm. D.	M. E.	Coin	Page
Haberkorn, J. B.	A. H.	Cherokee	Cherokee
Hanna, Harvey	Agron.	Manchester	Delaware
Hardman, Alberta	Sci.	Clarksville	Butler
Hartnell, B. T.	A. H.	Stacyville	Mitchell
Harvey, E. E.	A. H.	Jolley	Calhoun
Havens, C. B.	C. E.	Des Moines	Polk
Hawbaker, E. H.	A. H.	Stratford	Hamilton

Hawk, E. G.	Agron.	Moravia	Appanoose
Hawk, F. D.	A. H.	Cedar Falls	Black Hawk
Haynes, L. J.	Agrl.	Ames	Story
Hendricks, C. W.	A. H.	Muscatine	Muscatine
Henney, V. T.	E. E.	Mitchellville	Polk
Heuer, Lydia	Sci.	Dows	Wright
Hiestand, Ernest	Sci.	Ames	Story
Hiersche, Earle	Agron.	Early	Sac
Holloway, Edith	D. S.	Ames	Story
Holloway, Mrs. Eleanor	D. S.	Ames	Story
Hoopes, Amy W.	D. S.	Muscatine	Muscatine
Hoskin, Earl	A. H.	Cantril	Van Buren
Houghton, G. B.	Agron.	Hedrick	Keokuk
Howard, Carlotta	Sci.	Ames	Story
Hukill, E. C.	A. H.	Des Moines	Polk
Hull, Homer G.	A. H.	Beacon	Mahaska
Hummel, B. L.	A. H.	Newton	Jasper
Hyzer, Albert	A. H.	Storm Lake	Buena Vista
Jackway, R. E.	M. E.	Des Moines	Polk
Jeanson, R. E.	A. H.	Des Moines	Polk
Johnson, F. L.	Sci.	Boone	Boone
Jones, J. C.	Mn. E.	Cedar Falls	Black Hawk
Jorgensen, Elmer	C. E.	Ames	Story
Kelsey, C. J.	A. H.	Iowa Falls	Hardin
Kennedy, Lena	G. & D. S.	Ames	Story
Kepler, W. T.	A. H.	Davenport	Scott
Kirstein, J. E.	A. H.	Clarion	Wright
Knox, A. B.	M. E.	Cherokee	Cherokee
Koontz, Alph	A. H.	Des Moines	Polk
Kosnar, A. F.	A. H.	Clutier	Tama
Kruse, J. H.	A. H.	West Side	Crawford
Kuck, Leta	D. S.	Ames	Story
Lappin, Josephine	D. S.	Riceville	Mitchell
Larson, H. W.	Sci.	Swea City	Kossuth
Laughlin, H. H.	A. H.	Kirksville	*Missouri*
Lawrence, Stella McLain	D. S.	Ames	Story
Lee, L. V.	S. & A.	Sac City	Sac
Leffler, A. R.	A. H.	Stockport	Van Buren
Leffler, Martha	D. S.	Stockport	Van Buren
Leffler, Mary	D. S.	Stockport	Van Buren
Lieberknecht, H. A.	A. H.	Letts	Louisa
Livingston, Esther	D. S.	Ames	Story
Longer, Fred	C. E.	Washington	Washington
Luedtke, Ernest	A. H.	Fenton	Kossuth
Lytle, Mary	D. S.	Iowa City	Johnson
Mack, Lillian	D. S.	Waterloo	Black Hawk
Mallory, A. E.	A. H.	Hampton	Franklin
Maloney, Arthur	Dairy	Ames	Story
Manning, H. B.	A. H.	Ames	Story
Marks, W. H.	A. H.	Lake Park	Dickinson
Mata, Secundia	Agron.	Juayua el *Salvador,*	*C. A.*
Matteson, F. H.	A. H.	Lincoln	*Nebraska*
Maxwell, F.	A. H.	Traer	Tama
Meacham, H. A.	A. H.	Richland	Keokuk
Mellor, Lucretia	D. S.	Ames	Story
Metcalf, J. T.	A. H.	Paullina	O'Brien
Miller, C. C.	A. H.	Kellerton	Ringgold
Miller, Carl P.	Sci.	Randall	Hamilton
Mills, Vera	G. & D. S.	Jefferson	Greene

Moore, D. V.	Agron.	Dunlap	Harrison
Moore, Samuel	A. H.	Moulton	Appanoose
Murphy, J. L.	Agron.	Reinbeck	Grundy
Murphy, W. B.	A. H.	Springfield	*Ohio*
McDonald, Ethel	D. S.	Ames	Story
McElhinney, R. M.	A. H.	Waterloo	Black Hawk
McKelvy, Quintin	Agron.	Corydon	Wayne
McLaughlin, C. A.	A. H.	Monticello	Jones
Nash, Nellie	D. S.	Ames	Story
Neibert, J. S.	A. H.	San Antonio	*Texas*
Newport, G. H.	Mn. E.	Perry	Dallas
Nolan, Bob	A. H.	Hawarden	Sioux
Okey, Mrs. Myrtle McClure	G. & D. S.	Ames	Story
Osborn, E. E.	Agron.	Weston	Pottawattamie
Palmer, Robt.	A. H.	Sioux City	Woodbury
Parkison, W. K.	A. H.	Rensselaer	*Indiana*
Patterson, H. F.	A. H.	Burt	Kossuth
Paul, Harry	Ag.	Henderson	Mills
Pearson, A. T.	A. H.	Washington	Washington
Pelton, A. V.	Dairy	Ames	Story
Person, H. A.	Mn. E.	Ames	Story
Peterson, J. B.	A. H.	Morrison	*Illinois*
Pilkington, J. D.	A. H.	Red Oak	Montgomery
Plager, Robt.	A. H.	Grundy Center	Grundy
Poole, Jessie	D. S.	Ames	Story
Potee, Flora Ruth	D. S.	Ames	Story
Potter, E. L.	A. H.	Bozeman	*Montana*
Prather, J. F.	A. H.	Tarkio	*Missouri*
Rankin, J. O.	A. H.	Tarkio	*Missouri*
Rhoades, C. A.	Agrl.	Cooper	Greene
Rich, M. E.	A. H.	Chicago	*Illinois*
Richmond, R. R.	A. H.	Bancroft	Kossuth
Robbins, R. L.	A. H.	Hastings	Mills
Robinson, C. L.	A. H.	Norwalk	Warren
Rollins, J. C.	A. H.	Burr Oak	Winneshiek
Rowe, Louise	G. & D. S.	Boone	Boone
Salaverria, E.	A. H.	Salvador	*Central America*
Scholfield, H. H.	A. H.	Wausau	*Wisconsin*
Schulte, Louise	G. & D. S.	McGregor	Clayton
Scoates, R.	Mn. E.	Milwaukee	*Wisconsin*
Scott, Mrs. Elizabeth	D. S.	Ames	Story
Shields, J. E.	Hort.	Ames	Story
Simon, Ed.	Sci.	Council Bluffs	Pottawattamie
Simons, Geo. A.	A. H.	Ida Grove	Ida
Simpson, J. W.	A. H.	Whittemore	Kossuth
Smith, Leah	D. S.	Fairmont	*Nebraska*
Smith, L. H.	Agron.	Arthur	Ida
Snapp, R. E.	A. H.	Oakland	Pottawattamie
Souder, G. S.	Agron.	Rockwell City	Calhoun
Steen, Dorothea	D. S.	West Liberty	Muscatine
Stelle, A. C.	Sci.	Pasadena	*California*
Stevens, J. E.	Sci.	Boone	Boone
Stewart, S. A.	C. E.	Des Moines	Polk
St. John, Elsie	Sci.	Ames	Story
Stookey, D. D.	A. H.	Cedar Rapids	Linn
Stuckey, G. C.	A. H.	Knoxville	Marion
Swan, Ellen	Sci.	Storm Lake	Buena Vista
Swan, H. G.	Hort.	Independence	Buchanan
Swift, G. K.	S. & A.	Harlan	Shelby

Thies, A.	Agron.	Avoca	Pottawattamie
Tilden, B. A.	Agrl.	Ames	Story
Tullis, L. V.	A. H.	Decatur	Decatur
Twitchell, C. A.	Sci.	Lawton	Woodbury
Underwood, Nella Boyd	D. S.	Ames	Story
Van Meter, S. L.	A. H.	Lexington	*Kentucky*
Van Osdol, A. S.	A. H.	Morrison	*Illinois*
Varela, J. B.	M. E.	Ames	Story
Vincent, M. Inez	D. S.	Shenandoah	Page
Wagner, C. A.	C. E.	Boone	Boone
Walker, H. B.	C. E.	Des Moines	Polk
Wallace, D. P.	A. H.	Chicago Heights	*Illinois*
Walls, Florence	D. S.	Clinton	Clinton
Washburn, H. B.	Mn. E.	Hudson	Black Hawk
Wearin, J. F.	A. H.	Hastings	Mills
Welch, G. V.	C. E.	Ames	Story
Wellman, F. G.	A. H.	Monona	Clayton
West, E. C.	Sci.	Des Moines	Polk
White, Raymond	M. E.	Indianola	Warren
White, Ross	C. E.	Bagley	Guthrie
Williams, J. C.	A. H.	Ames	Story
Williamson, Samuel	M. E.	Ames	Story
Wilmarth, R. H.	C. E.	Ames	Story
Wood, H. N.	A. H.	Iowa Falls	Hardin
Wyckoff, T. L.	A. H.	Panora	Guthrie

ONE YEAR DAIRY STUDENTS.

NAME	TOWN	COUNTY
Chase, John	Greeley	Delaware
Dunn, Guy	Earlville	Delaware
Ellis, G. S.	Swea City	Kossuth
Esdohr, E. C.	Coon Rapids	Carroll
Hardy, W. A.	Goodland	*Indiana*
Harvey, W. A.	La Porte City	Black Hawk
Hill, R. J.	Alden	Hardin
Lindbloom, Selam	Fairmont	*Minnesota*
Maus, H. W.	Baxter	Jasper
Rhoades, F. O.	Cooper	Greene
Ross, W. E.	Lamont	Buchanan
Stenberg, James	Ellsworth	Hamilton
Swatosh, E. A.	Belle Plaine	Benton
Swatosh, J. L.	Belle Plaine	Benton
Wallace, C. E.	Nevinville	Adams
Wrage, J. E.	Arlington	*Washington*
Zierath, Chas.	Boyd	Chickashaw

MUSIC STUDENTS.

NAME	COURSE	COUNTY	TOWN
Abrahamson, J.	V.	Morning Sun	Louisa
Allan, Ronald	V. P.	Ames	Story
Archer, Gladys	P.	Archer	O'Brien
Armstrong, Alice	V.	Chicago	*Illinois*
Barrett, Ruth D.	P.	Ames	Story
Baxter, S. G.	P.	Buckingham	Tama
Ballard, Mrs. Lena	P.	Ames	Story
Beach, Frank	P.	Ames	Story
Beard, Vivian D.	P.	Osceola	Clark
Benajmin, Leona	V.	Newton	Jasper

Berggren, Ruby M	P.	Sheldahl	Story
Beyer, Mrs. S. W.	P. V.	Ames	Story
*Beyers, Winifred	V	Ames	Story
Blake, Fred	V.	Maquoketa	Jackson
Bouricius, G. J.	V.	Council Bluffs	Potawattamie
Brown, Lydia	O.	Ames	Story
Bruegger, G.	V.	Lake City	Calhoun
Byers, Jessamine I.	P. V.	Colo	Story
Calonkey, Josephine	P.	Woodward	Dallas
Cessna, Ethyl		Ames	Story
Cleghorn, Frances	P.	Owana	Monona
Clark, Robert Mason	V.	Ames	Story
Craddick, Blanche	V.	Nevada	Story
Culp, Opal	P.	Ames	Story
Cunningham, Charlotte	V.	Washington	Washington
Cutter, Marion Louise	P. H.	Aurora	*Illinois*
Cobb, Mattie	V.	Boone	Boone
Conaway, Laura	P.	Ames	Story
Davis, Ralph E.	V.	New Virginia	Warren
De Klotz, Francis	P.	Kirkman	Shelby
Dudgeon, Winfield	V.	Pella	Marion
Edenson, Selma	P.	Ames	Story
Edwards, Reba	P.	Ames	Story
Emerson, J. G.	P.	Burchinal	Cerro Gordo
Ferguson, Myrtle	P.	Sioux City	Woodbury
Forsythe, Mary	P.	Ames	Story
Grayson, Gertrude	V.	Ontario	Story
Guthrie, William D.	V.	Coin	Page
Harsh, Alta E.	V.	Nevada	Story
Haskins, W. A.	V.	Whitten	Hardin
Hawbaker, E. H.	V.	Stratford	Hamilton
Heers, Laura	P.	Story City	Story
Holden, David	P.	Ames	Story
Hoopes, Amy	P. V. H.	Muscatine	Muscatine
Hopkins, Blanche	P. V.	Nevada	Story
Hunt, A. E.	P. O. H. V.	Ames	Story
Jay, B. A.	V.	Blakesburg	Wapello
Johnson, Daisy		Ames	Story
Kierulff, Anna	V.	Ames	Story
Knapp, Seaman	V.	Ames	Story
Kyhl, L. C.	V.	Clinton	Clinton
Lappin, Josephine	P.	Riceville	Mitchell
Larsen, Mrs. Vivian	O.	Nevada	Story
Leland, Margaret	P.	Ames	Story
Lowery, Laura	P.	**Jewell**	Hamilton
Lytle, Mary	P.	Iowa City	Johnson
McCarthy, Florence	V.	Ames	Story
McKay, Robert	P.	Ames	Story
McElroy, Margaret	O.	Newton	Jasper
McKibben, H. B.	V.	Storm Lake	Buena Vista
Macklin, Theo	P.	Shanghai	*China*
Meneray, A. O.	P.	Council Bluffs	Pottawattamie
Mereness, Gertrude	V.	Ames	Story
Minchin, Medora	P.	Ames	Story
Morris, Edward	P.	Ames	Story
Nelson, Kate	P.	Story City	Story
O'Brien, Mrs. F. B.	V.	Ames	Story

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*Deceased.

Okey, F. M.	P.	Ames	Story
Orcutt, Louis E.	O. H.	Council Bluffs	Pottawattamie
Overland, Leva	V.	Story City	Story
Parsons, Mildred	P.	Ames	Story
Parsons, Ruby Ruth	V.	Ames	Story
Pearson, A. F.	Cor.	Washington	Washington
Pike, Ethel	V. H.	Iowa City	Johnson
Priester, Henry	O.	Davenport	Scott
Robb, Olive Lyle	P. V. H.	Estherville	Emmett
Schantz, L. C.	P.	Wayland	Henry
Schmidt, Marie	V. P.	Ames	Story
Schofield, Mark	V.	Wausau	*Wisconsin*
Schulte, Louise	V.	McGregor	Clayton
Shaw, Don B.	V.	Monroe	Jasper
Smith, Adah	P.	Gladbrook	Taylor
Smith, Anna Laura	P.	Ames	Story
Smith, Bertha	P. V.	Ames	Story
Smith, Lulu	V.	Ames	Story
Smith, May	V.	Marshalltown	Marshall
Storms, Florence	P.	Ames	Story
Storms, Laura	P.	Ames	Story
Storms, Lillian	V.	Ames	Story
Swan, Ellen	P.	Storm Lake	Buena Vista
Sykes, Erma A.	P.	Ames	Story
Tinsley, Grace Eloise	V.	Ames	Story
Thurman, A. G.	V.	Blanchard	Page
Troutner, Edith	P.	Charles City	Floyd
Ware, Mabel G.	V.	Gilbert	Story
Wentworth, E. N.	V.	Ames	Story
Weston, Vallie	P.	Ames	Story
Wills, George M.	V.	Eldora	Hardin
Wilson, W. M.	V.	Ames	Story
Wolff, Robert	V.	Lytton	Story
Wood, Mrs. Mayme	H. V.	Ames	Story
Zimmerman, Phoebe	P.	Ames	Story
Wilson, Mary M.	P.	Cincinnati	Appanoose

P.—Piano. V.—Voice. O.—Organ H.—Harmony. Cor.—Cornet.

SIGHT SINGING CLASS.

NAME	TOWN	COUNTY
Adams, O. E.	Smithland	Woodbury
Askey, George	Red Oak	Montgomery
Browne, H. H.	Knoxville	Marion
Capper, Charles	Woodward	Dallas
Copeland, Frank B	Logan	Harrison
Dudgeon, Winfield	Pella	Marion
Eldridge, Madge	Ames	Story
Griffith, Bessie	Ames	Story
Hoopes, Amy	Muscatine	Muscatine
Howe, John L.	Council Bluffs	Potawattamie
Hutcheson, Charley R.	West Branch	Cedar
Johnson, Floyd	Boone	Boone
Jones, R. H.	Des Moines	Oak
Leerberg, N.	Marshalltown	Marshall
McDonald, Ethel	Ames	Story
Naylor, Joe	Clear Lake	Cerro Gordo
Pearson, Frank	Washington	Washington
Peters, C. H.	Grinnell	Poweshiek

Schmidt, Marie	Ames	Story
Smith, Bertha	Ames	Story
Smith, Lulu	Ames	Story
Stewart, Everett	Washington	Washington
Thurman, A. G.	Washington	Washington
Taylor, J. L.	Ames	Story
White, S. K.	Hartford	*Connecticut*
Zentmire, D.	Ames	Story
Zentmire, Zelma	Ames	Story
Zimmerman, A. G.	Washta	Cherokee

ENROLLMENT FOR SHORT COURSES IN STOCK AND GRAIN JUDGING.

NAME	TOWN	COUNTY
Acker, Elwood	Casey	Guthrie
Adams, R. K.	Solon	Johnson
Adamson, John C.	Moorland	Webster
Adamson, Ralph J.	Moorland	Webster
Albaugh, Elmer L.	Ankeny	Polk
Allen, Will	Marne	Cass
*Allinson, Chas J.	Hampton	Franklin
Anderson, Emil A.	Swea City	Kossuth
Anderson, Ernest O.	Alta	Buena Vista
Anderson, R. Kirk	Mason City	Cerro Gordo
Armstrong, Leroy H.	Le Grand	Marshall
Art, R. A.	Hartford	Warren
Assenk, George	Kanawha	Hancock
Aten, Ed	Humeston	Wayne
Baird, Robt. L.	Denmark	Lee
Baker, Wm. C.	Emmetsburg	Palo Alto
Bakehouse, Albert	Sigourney	Keokuk
**Baldwin, Amos J.	Battle Creek	Ida
Bane, Roy	Bondurant	Polk
Bank, Carl C.	Donnellson	Lee
Banks, C. H.	Knoxville	Marion
Barber, Leslie S.	Corwith	Hancock
Barnes, John	Greenfield	Adair
Barnes, Will	Tabor	Mills
Bass, Will M.	Boone	Boone
Bass, W. T.	Waukee	Dallas
*Baughey, Lloyd	Nora Springs	Floyd
Baughey, W. W.	Nora Springs	Floyd
Bay, Hylie	Albia	Monroe
Bechley, Chas.	Searsboro	Poweshiek
*Bell, Burch	Aurelia	Cherokee
Benson, Alvin	Popejoy	Franklin
Bentley, B. F.	Boone	Boone
Berggren, Elmer	Stanhope	Hamilton
Binford, Ed	Liscomb	Marshall
Binkert, Ed.	Lake City	Calhoun
Bishop, C. R.	Altoona	Polk
Blake, John	Carlisle	Warren
Bloss, Cris	Early	Sac
Boleyn, C.	Specht's Ferry	Dubuque
Bond, A. R.	Lamont	Buchanan
Boody, Reuben H.	Belle Plaine	Benton
Bouska, Chas.	Protivin	Howard
Bowman, F. B.	Garden Grove	Decatur

Brant, C. P.	Garden Grove	Decatur
Brewer, W. L.	Corydon	Wayne
Briley, B. C.	Ames	Story
Brouillette, Harvey	Salix	Woodbury
Brown, Arthur E.	Turkey River	Clayton
Brown, C. Burton	Anamosa	Jones
Brown, Henry D.	Traer	Tama
Brown, H. E.	Salix	Woodbury
Brown, Howard F.	Marcus	Cherokee
Brown, Murice	Garden Grove	Decatur
Buck, Herbert W.	Greenfield	Adair
Burford, T. V.	Des Moines	Polk
Burke, Daniel	Epworth	Dubuque
Burkestrand, A. J.	Cambridge	Story
Burmeister, Emil E.	Donahue	Scott
*Burt, Neal	Coggon	Linn
Bush, Guy L.	Middle River	Madison
Buterbaugh, O. M.	Dallas Center	Dallas
Butler, Bert	Montezuma	Poweshiek
Butler, Byron T.	Afton	Union
Caldwell, J. W.	Afton	Union
Campbell, C. W.	Gravity	Taylor
Campbell, Ray L.	Oto	Woodbury
Campney, J. E.	Plover	Pocahontas
Canavan, James	Gowrie	Webster
Canavan, Pat	Gowrie	Webster
Carlson, Arthur W.	Ogden	Boone
Carlson, Edwin	Gowrie	Webster
Carlson, Henry W.	Ogden	Boone
Carpenter, Frank I.	Alta	Buena Vista
Cass, Isaac H.	Wyanet	*Illinois*
Challman, Will	Marcus	Cherokee
Chambers, R. V.	Knoxville	Marion
Cheedle, Orin	Paton	Greene
Cheney, William H.	Greene	Butler
Child, Adelbert	Albany	*Nebraska*
Christensen, Arthur	Linn Grove	Clay
Christiansen, Niels	Ringsted	Emmet
Clark, Chas. W.	Fairfield	Jefferson
Clark, Howard F.	Albia	Monroe
Coiner, Chas. W.	Malvern	Mills
Cook, Lyle W.	Miles	Jackson
Cooper, Morton O.	Knierim	Calhoun
Corlett, Hale	Farmersburg	Clayton
Cornelison, Guy	Benton	Ringgold
Cornwell, Harry	Ankeny	Polk
Coverdale, C. F.	Delmar	Clinton
Coverdale, J. W.	Elwood	Clinton
Cram, R. W.	Kelley	Story
Crouse, E. F.	Dike	Grundy
Crouse, F. H.	Dike	Grundy
Cumings, Arthur B.	Tabor	Fremont
Cutter, E. Charles	Des Moines	Polk
Dahlgren, Walter W.	Riverton	Fremont
Daniels, M. R.	Pulaski	Davis
Danlea, Frank	Rowley	Buchanan
Datisman, Fred G.	Specht's Ferry	Dubuque
*Davidson, D.	Northwood	Worth
Davis, Roy V.	Garden Grove	Decatur

Day, John P.	Afton	Union
Dee, John	Brooklyn	Poweshiek
*De Forest, Ray	Dows	Wright
Deihl, Sam J.	Wapello	Louisa
Denhart, John	Diagonal	Ringgold
Denney, Ray	Macksburg	Madison
Detloff, H. C.	Le Mars	Plymouth
Dettmer, H. H.	Garnavillo	Clayton
Devault, Albert	Earlham	Madison
Devault, J. J.	Ames	Story
De Vault, Orange J.	Earlham	Madison
Doebel, Grover C.	Manly	Worth
Donovan, Daniel	Notre Dame	*Indiana*
Drennan, Lloyd W.	Corning	Adams
Dreger, Henry K.	Lone Rock	Kossuth
Du Bois, R. C.	Mt. Vernon	Linn
Duhigg, Charles	Ayrshire	Palo Alto
Duncan, Harland H.	Alexis	*Illinois*
Dunning, John P.	Moville	Woodbury
Duthie, Vernet	Anita	Cass
Eberle, J. H.	Manilla	Crawford
Eblen, Harrison	Massena	Cass
Edenson, J. E.	Ames	Story
Ehrhardt, Carl R.	Elkader	Clayton
*Ehrhardt, Will	Elkader	Clayton
Eitel, A. L.	Hawkeye	Fayette
Eller, Louis	Radcliffe	Hardin
Ellis, Walter J.	Ames	Story
Elwell, Fred N.	Bismarck	*North Dakota*
Engstrom, E. L.	Boone	Boone
Erickson, A. E.	Armstrong	Emmet
Erickson, Gust E.	Lanyon	Webster
Erickson, Reuben L.	Lanyon	Webster
Escher, Earl	Tipton	Cedar
Estle, Roy R.	Minburn	Dallas
Estle, W. L.	Gravity	Taylor
Evans, G. W.	Hedrick	Keokuk
Eversman, Joseph	Burlington	Des Moines
Eyestone, Chas. L.	Wellman	Washington
Fanberg, C. J. Zebulon	Arthur	Ida
Farming, S. A.	Early	Sac
Farquhar, Geo. P.	Coin	Page
Ferguson, Curtis	Fremont	Mahaska
Ferguson, Earl	Fremont	Mahaska
Ferguson, Fred	Lake City	Calhoun
Ferguson, L. E.	Laurens	Pocahontas
Ferrin, E. F.	Cherokee	Cherokee
Field, Jessica	Clarinda	Page
Finnegan, Chas.	Panora	Guthrie
Finnell, J. F. C.	Hamburg	Fremont
Fleener, Evan,	Oskaloosa	Mahaska
Flett, G.	Dows	Wright
Fogg, Walter E.	West Liberty	Muscatine
Forest, Chas. R.	Miles	Jackson
Fox, C. A.	Dallas Center	Dallas
Fox, Geo. M.	Dallas Center	Dallas
Frericks, Geo. C	Coleridge	*Nebraska*
Frick, D. R.	Conroy	Iowa
Frye, Wilbert H.	Davenport	Scott

Funk, Chester	Cedar	Mahaska
Funk, Dawson	Fremont	Mahaska
Gabeline, F. R.	Morning Sun	Louisa
Gabeline, P. I.	Morning Sun	Louisa
Gaden, John	Remsen	Plymouth
Garrett, Chas. O.	Mitchellville	Polk
Garrity, J. J.	De Witt	Clinton
Gast, Calvin R.	Davenport	Scott
*Gatewood, Ray	Packwood	Jefferson
Gaumer, B. F.	Hopeville	Clarke
Ghrist, C. E.	Ames	Story
Gillette, Roy U.	Fostoria	Clay
Gillmore, I. F.	Dixon	Scott
Gleason, Glen	Mechanicsville	Cedar
Godoy, J. C.	Ames	Story
Goodall, F. A.	Toronto	Clinton
Goodner, Omer D.	New Sharon	Mahaska
Gorsuch, Guy W.	Montezuma	Poweshiek
Graham, H. S.	Albia	Monroe
Gray, W. L.	Dallas Center	Dallas
Greer, C. K.	Monticello	Jones
Griffin, Carl A.	Masonville	Deleware
Griffin, Clyde	Manson	Calhoun
Griffith, Floyd	Manson	Calhoun
Griswold, L. W.	Cooper	Greene
Hadley, Wm. J.	Thor	Humboldt
Hahn, Grover W.	Walcott	Scott
Hale, Cabell	Rapid City	*South Dakota*
Hall, Clide W.	Webster City	Hamilton
Hall, Ralph O.	Webster City	Hamilton
Hannah, R. Ralph	Breda	Carroll
Hansen, Alfred	Goldfield	Wright
Hansen, Carl G.	Story City	Story
Hansen, Perry N.	Dallas Center	Dallas
Hanson, Edmund P.	Dean	Appanoose
Hanson, Fred B.	Inwood	Lyon
Hanson, Lloyd	Dean	Appanoose
Hanson, William	Dayton	Webster
Harding, Charles H.	Des Moines	Polk
Hariff, P. J.	Lamoni	Decatur
Harmeyer, Al	West Point	Lee
Hartley, W. R.	Pomeroy	Calhoun
Hasbrouck, I. O.	Humeston	Wayne
Hastie, Eugene N.	Perry	Dallas
Hathway, Delwin B.	Turin	Monona
Haymond, B. A.	La Porte City	Black Hawk
Hays, Lee	Hamlin	Audubon
Heller, Roy	Victor	Iowa
Henderson, Walter	Randall	Hamilton
Hendrickson, Ray	Jewell Junction	Hamilton
Herrold, Fred	Grimes	Polk
Herriott, A. C.	Casey	Guthrie
Hesseltine, Harry S.	Washington	Washington
*Hesseltine, Merlin J.	Brighton	Washington
Hicks, Chas. W.	Early	Sac
Hildreth, Art	Slater	Story
Hildreth, J. M.	Slater	Story
Hill, Carlos V.	Montezuma	Poweshiek
Hilton, Harry	Malvern	Mills

Hinde, A. H.	Early	Sac
Hinkhouse, F. W.	West Liberty	Muscatine
Hoffman, Ezra D.	Afton	Union
Hoffman, Frank	Knoxville	Marion
Hoffman, Harry	Delmar	Clinton
Hohn, Fred M.	Thor	Humboldt
Hollander, E. J.	Logan	Harrison
Hollander, Max	Ida Grove	Ida
Hollingsworth, D. E.	Peru	Madison
Hoover, Walter S.	Princeton	*Illinois*
Hoskins, Gilbert	Pleasant Plain	Washington
Hoskins, Otis	Cedar	Mahaska
Houston, Roy E.	Clarinda	Page
Hunter, A. C.	Cranston	Muscatine
Hunter, Walter G.	Anita	Cass
Irwin, Orie F.	Wall Lake	Sac
Irwin, Robert P.	Wall Lake	Sac
Irwin, Roy	Wall Lake	Sac
Jackson, Thomas	Whiting	Monona
Jacobsen, D. H.	Gilbert Station	Story
Jacobson, N. H.	Ames	Story
Jefferis, Clarence G.	Rock Rapids	Lyon
Johnson, Lewis	Newell	Buena Vista
Johnson, Charles	Hawarden	Sioux
Johnson, Emil A.	Kiron	Crawford
Johnson, M. L.	Imogen	*Minnesota*
Johnson, Warren T.	Grinnell	Poweshiek
Jones, Burnace R.	Boone	Boone
Kalsem, S. J.	Huxley	Story
Keen, C. T.	Le Grand	Marshall
Keenan, Frank	Shenandoah	Page
Kehor, Thos. F.	Hopkinton	Jones
Kennedy, Carl N.	Ankeny	Polk
Kennedy, Jas.	Altoona	Polk
Kirby, W. Raymond	Davenport	Scott
Kirstein, Fred L.	Clarion	Wright
Kirstein, George	Clarion	Wright
Knight, Harry	Fairfield	Jefferson
Knuth, William	McCausland	Scott
Kruse, John L. A.	Goose Lake	Clinton
Krusemark, Louis R.	Sheffield	Franklin
*Kunes, Wm. G.	Cresco	Howard
Kurtz, Hubert P.	Pleasant Plain	Jefferson
Kurtzweil, Geo. L.	Altoona	Polk
Kurz, Fred L.	Morning Sun	Louisa
Laage, Waldemar	Lone Rock	Kossuth
Lamond, J. Emmet	Montezuma	Poweshiek
Lampman, D. W.	Varina	Pocahontas
Lan, Edwarda F.	Ames	Story
Larsen, Hans	Ringsted	Emmet
Larson, Leonard	Aurelia	Cherokee
Laughlin, H. H.	Kirksville	*Missouri*
Lauritsen, Lonie	Delmar	Clinton
Law, Albert A.	Audubon	Audubon
Law, Earl	Audubon	Audubon
Lee, A. B.	Mitchellville	Polk
Lee, Wm. G.	Mitchellville	Polk
Leonard, E. S.	Corning	Taylor
Lindgren, Arthur	Marathon	Buena Vista

Lindskoog, M. E.	Kiron	Crawford
Lippman, Julius R.	Brighton	Jefferson
Lolman, Barney	West Point	Lee
Luedtke, Bernhart	Lone Rock	Kossuth
Luedtke, Ernest H.	Fenton	Kossuth
Lytle, Aber	Oskaloosa	Mahaska
Lytle, James S.	Oskaloosa	Mahaska
Macy, Roland E.	New Providence	Hardin
Madison, Marquis	Goldfield	Humboldt
Mann, A. T.	Thurman	Fremont
Mansfield, T. P.	Rhodes	Marshall
Mapel, Tom	Rockwell	Calhoun
Martin, Albert	Sutherland	O'Brien
Martin, Fred B	Schodack L'nd'g	*New York*
Mason, J. A.	Carlisle	Warren
Mason, Wm	Carlisle	Warren
Mather, Dayton W.	Clarksville	Butler
Mathews, L. W.	Tipton	Cedar
Mawdsley, E. R.	Burt	Kossuth
Mayes, O. M.	Tipton	Cedar
Mayville, J. P.	Elkader	Clayton
Meeker, Grover	Hubbard	Hardin
Meeker, Herbert	Hubbard	Hardin
Mendenhall, L. H.	Earlham	Madison
Merrill, E. W.	Rock Rapids	Lyon
Meyer, Clarence	Van Meter	Madison
Meyer, John W.	Minden	Potowattamie
Meyers, Clifford	Waterloo	Black Hawk
*Miller, Alvin	Independence	Buchanan
Miller, Charles E.	Dubuque	Dubuque
Miller, Cyrus C.	Kellerton	Ringgold
Miller, E. G.	Melbourne	Marshall
Miller, E. J.	Waterloo	Black Hawk
Miller, Lloyd H.	Waterloo	Black Hawk
Miller, Nick	Pine Ridge	*South Dakota*
Miller, W. J.	Ankeny	Polk
Minish, A. J.	Vorhees	Black Hawk
Minteer, Claude C.	Van Meter	Dallas
Minteer, Clyde O.	Van Meter	Dallas
Montgomery, F. B.	Mt. Pleasant	Henry
Moore, C. Ray	Kellerton	Ringgold
Moore, Frank	Anthon	Woodbury
*Moore, Ray P.	Dougherty	Cerro Gordo
Morris, J. F.	Ireton	Sioux
Morris, Walter	Wapello	Louisa
Morton, Clarence	Moville	Woodbury
Motsick, Jerry	Rippey	Greene
Mudge, Geo. W.	Ottumwa	Wapello
Musil, Charles	Floyd	Floyd
Myhre, Alfred	Estherville	Emmet
McArthur, Harry	Mason City	Cerro Gordo
McCormack, Frank K.	Peterson	Clay
McCoy, John Ware	Humeston	Wayne
McCullough, Jesse W.	Walnut	Potowattamie
McCutcheon, Will H.	Eagle Grove	Wright
Mac Donald, J. R.	Montezma	Poweshiek
McDowell, Lloyd	Hudson	Black Hawk
McKee, Fred A.	Montezuma	Poweshiek
McLaughlin, W. F.	Schaller	Sac

McLennan, Waldo S.	Hartwick	Poweshiek
McMahon, T. F.	Tara	Webster
McNamara, Richard	Winterset	Madison
McWhorter, Hugh	Aledo	*Illinois*
Neal, C. W.	Moorhead	Monona
Neff, Neil L.	Earlham	Madison
Nelson, M. J.	Cambridge	Story
Nelson, Miller S.	Goldfield	Wright
Nelson, Swan	Pomeroy	Calhoun
Newcomer, Ed	Newburg	Jasper
Niccolls, J. F.	Morning Sun	Louisa
Nichols, Charles	Cresco	Howard
Nims, Henry L.	Emerson	Mills
Norris, D. C.	Prairie City	Jasper
Norris, E. F.	Prairie City	Jasper
Nunn, Walter E.	Marne	Cass
Olson, John	Calamus	Clinton
Osburn, E. L.	Bedford	Taylor
Oliver, Ned G.	Packwood	Jefferson
Olson, Roy	Burnside	Webster
*Owells, William H.	Sac City	Sac
Pack, Lloyd	Paton	Greene
Packer, K. L.	Rockwell City	Calhoun
Paetz, Carl H.	Algona	Kossuth
Page, Frank H.	Des Moines	Polk
Palmer, F. A.	Eddyville	Mahaska
Palmer, Geo. W.	Newburg	Jasper
Pantenburg, Peter J.	Ames	Story
Parker, Guy	Malvern	Mills
Parker, H. R.	Malvern	Mills
*Parmenter, Glee	Grimes	Polk
Patton, J. O.	Albia	Monroe
Peebles, Fred	Lake City	Calhoun
Peitzman, Chas.	Grimes	Polk
Pequignot, Ned	Fairfield	Jefferson
Pellett, Clarence A.	Atlantic	Cass
Perrin, Loren	Albia	Monroe
Peters, Ray A.	Cherokee	Cherokee
Peterson, Chris A.	Calamus	Clinton
Peterson, Ernest	Cherokee	Cherokee
Phillips, C. E.	Centerville	Appanoose
Poduska, J. V.	Pocahontas	Pocahontas
Ponton, Harry H.	Ames	Story
Powers, R. J.	Persia	Harrison
Purvis, Ed	Bridgewater	Cass
Prather, J. F.	Tarkio	*Missouri*
Prine, Homer	Oskaloosa	Mahaska
Pritchard, Harry A.	Boone	Boone
Proudfit, R. E.	Altoona	Polk
Rabe, Lewis G.	Alta Vista	Chickasaw
Rankin, T. B.	Tarkio	*Missouri*
Rasmussen, Hans	Eagle Grove	Humboldt
Rasmussen, Hans C.	Garner	Hancock
Rasmussen, H. L.	Newell	Buena Vista
Rasp, Geo. R.	Newburg	Jasper
Rath, H. Earl	Mason City	Cerro Gordo
Redling, Theodore, Jr.	Jewell	Hamilton
*Reed, Ernest	Lenox	Taylor
Reed, Perry	Guthrie Center	Guthrie

Reidd, Ray	Albion	Marshall
Remien, Alfred	Marne	Cass
Reynolds, R. D.	Berwick	Polk
Rhoades, C. A.	Cooper	Greene
Rice, B. B.	Grand Island	*Nebraska*
Rich, I. W.	Guthrie Center	Guthrie
Rielly, Thomas J.	Rock Valley	Sioux
Riley, Wilfred O.	Cring	Adams
Rinker, Ernest E.	Rippey	Green
Ritland, O. E.	Roland	Story
Rittgers, T. D.	Dallas Center	Dallas
obinson, Chas.	Beaconsfield	Ringgold
obinson, C. L.	Norwalk	Warren
oggenbach, Robert F.	Altona	*Nebraska*
osenfeld, Carl A.	Kelley	Story
ostat, Harvey L.	Greenfield	Adair
ucker, Leroy	Prairie City	Jasper
alisbury, Henry	Fayette	Fayette
ampson, Stephen J.	Goldfield	Humboldt
andahl, Martin	Stanhope	Hamilton
anders, F. L.	Hartley	O'Brien
anny, George	Marne	Cass
auer, Wm. H.	Muscatine	Muscatine
chaub, C. O.	Ames	Story
cherer, Arthur	Afton	Union
chertz, J. C.	Ottumwa	Wapello
child, John	Belle Plaine	Benton
chmidt, A. J.	Hartley	O'Brien
chmidt, H. B.	Knoxville	Marion
chmidt, H. H.	Steamboat Rock	Hardin
chreiber, A. G.	Sibley	Osceola
chreiber, Martin	Sibley	Osceola
chroeder, Henry B.	Schleswig	Crawford
chuany, Arthur	Lorimer	Union
aline, Arvid	Stanhope	Hamilton
idl, J. B.	Coon Rapids	Carroll
lle, H. C.	Grinnell	Poweshiek
lway, R. R.	Sheridan	*Wyoming*
wick, Vernon	Jesup	Blackhawk
xauer, Jacob	Ankeny	Polk
annon, J. Lionel	Ames	Story
arer, Arch	Alexis	*Illinois*
aw, F. E.	Emerson	Mills
erer, Carl	Council Bluffs	Pottawattamie
eriff, L. J.	Orient	Adair
ields, Le Roy	Grand River	Clarke
imer, John	Nora Springs	Floyd
ipley, E. R.	Lineville	Wayne
ivers, C. C.	Knoxville	Marion
als, J. W.	Ames	Story
emaker, L. L.	Corning	Adams
eman, W. H.	Waukee	Dallas
ok, Elza H.	Mason City	Cerro Gordo
pson, E. E.	Newton	Jasper
ith, Earl	Clemons	Marshall
ith, Geo. Z.	Macksburg	Madison
ith, Norman J.	Marcus	Cherokee
ith, W. D.	Garden Grove	Decatur
der, Hubert	Masonville	Buchanan

Spear, Willis B.	Sheridan	*Wyoming*
Stanfield, Perry	Auburn	Calhoun
Steenback, Henry	Persia	Harrison
Stenhouse, B. A.	Early	Sac
Stirling, Howard P.	Pioneer	Humboldt
Stevenson, Will D.	Hancock	Pottawattamie
Stewart, John L .	Orient	Adair
Stitt, Port	Yorktown	Page
Stock, E. R.	Manly	Worth
Storm, Geo. E.	Rockwell City	Calhoun
Strawn, Walter	Ottawa	*Illinois*
Stuart, R. M.	Des Moines	Polk
Stuedemann, B. N.	Lyons	Clinton
Sullivan, Daniel J.	Corning	Adams
Summers, Herbert	Fairfield	Jefferson
Sundquest, Harry	Derby	Lucas
Sutherland, Hugh B.	Chicago	*Illinois*
Swan, R. L.	Creston	Union
Swan, Wm. H.	Creston	Union
Swanson, A. L.	Armstrong	Emmet
Swanson, George	Pomeroy	Calhoun
Switzer, C. C.	Carlisle	Warren
Talcott, Myron E.	Maynard	Fayette
Taylor, Clair	Ames	Story
Thies, Chas.	Avoca	Pottawatamie
Thompson, Sheridan	Ankeny	Polk
*Thornburg, Arlie R.	Indianola	Warren
Tischhauser, Ernest	Specht's Ferry	Dubuque
Titus, E. A.	Yetter	Calhoun
Tolstrup, James	Jewell	Hamilton
Treimer, George L.	Walcott	Scott
Treiner, Herman	Dixon	Scott
Trelvar, Ellsworth	Nora Springs	Cerro Gordo
Treshaur, James	Vincennes	*Indiana*
Troster, Ray	Allerton	Wayne
Trumbull, W. W.	Huntley	*Illinois*
Turin, Albin	Kiron	Ida
Ufford, Orville	Ames	Story
Upmeyer, P.	Solon	Johnson
Ure, R. E.	New Hampton	Chickasaw
Vail, I. N.	Zearing	Story
Varnum, John M.	Zearing	Story
Voelker, Ed	Farmersburg	Clayton
Vosika, Chas. H.	Pocahontas	Pocahontas
Wagoner, Walter	New Providence	Hardin
Walker, Wm. O.	Macksburg	Madison
Walter, Chas.	Mitchellville	Polk
Warner, France	Goldfield	Wright
Warner, V. G.	Bloomfield	Davis
*Wasson, Carl	Panora	Guthrie
Watland, John	Petersburg	*Nebraska*
Watt, Andrew	Anamosa	Jones
Watt, Percy	Hawarden	Sioux
Way, Rollie	Anita	Cass
Welch, J. A.	Knoxville	Marion
Wester, Wm.	Cherokee	Cherokee
Weston, C. E.	Ames	Story
White, Chas. M.	Belle Plaine	Benton
Whittune, A. H.	Stuart	Adair

Willey, Claude E.	Mason City	Cerro Gordo
Willhite, Joseph V.	Grant City	*Missouri*
*Willhoit, Harry	Oskaloosa	Mahaska
Williams, Arthur	Ottumwa	Wapello
Wills, T. A.	Fairmont	*Minnesota*
Wilson, Claude E.	Silver City	Mills
Wilson, Earle E.	Hebron	Adair
Wilson, Glen M.	Ankeny	Polk
Wilson, Roy E.	Dickens	Clay
Wilson, J. S.	Almont	Clinton
Wimer, Hoyt	New Sharon	Mahaska
Wise, Guy	Manson	Calhoun
Witham, R. E.	Orient	Adair
Wood, Jay C.	Traer	Tama
Wood, Roy A.	Soldier	Monono
Woodford, H. L.	Sergeant Bluff	Woodbury
*Woods, Raymond	Estherville	Emmet
Woolley, Fred	Garden Grove	Decatur
Wygle, Frank	Clarksville	Butler
Yelland, Chester	Sheffield	Franklin
Yocum, J. C.	McCausland	Scott
Yoder, Louis V.	Iowa City	Johnson
Young, Fred	Des Moines	Polk
Zearfoss, S. I.	Ames	Story
Zeller, Willard	Cooper	Greene
Zimmerman, Leo	Wapello	Louisa

*Scholarship.
**½ Scholarship.

Total—541.

ENROLLMENT FOR SHORT COURSE IN DAIRYING.

NAME	TOWN	COUNTY
Allard, G. F.	Pomeroy	Calhoun
Bakken, Michael E.	Spring Grove	*Minnesota*
Berry, Edd R.	Indianola	Warren
Borghem, T. M.	Nemaha	Sac
Brook, Jacob	Earling	Shelby
Brotherton, Leonard	Creston	Union
Buffington, Chas.	Zearing	Story
Burt, Roy A.	Armstrong	Emmet
Capper, O. C.	Westgate	Fayette
Charlson, O. S.	Randall	Hamilton
Clarke, T. A.	West Bend	Palo Alto
Cline, Warren E.	Casey	Guthrie
Cochrane, A.	Corley	Shelby
Colbert, H. H.	Menlo	Guthrie
Crocker, H. M.	Columbus	*Nebraska*
Dack, L. J.	Wyalusing	*Wisconsin*
Dahell, Ellis R.	Guthrie Center	Guthrie
Day, Chas. A.	Sumner	Fayette
Drake, Geo. M.	Owatonna	*Minnesota*
Edwards, W. R.	Williamsburg	Iowa
Evans, Walter	Bedford	Taylor
Ewing, R. D.	Clarinda	Page
enger, T. A.	Garner	Hancock
rank, W. C.	Forest City	Winnebago

Gowdey, L. E.	Dexter	Dallas
Grove, H. H.	Plover	Pocahontas
Gustin, Orie J.	Leon	Decatur
Jarvis, Arthur	Humeston	Wayne
Johnson, Geo. M.	Ellsworth	Hamilton
Jones, J. R.	Iowa Falls	Hardin
Junker, Matt	Harlan	Shelby
Kaderabek, Wenzel A.	Spirit Lake	Dickinson
Kaencher, A. W.	McIntire	Mitchell
Komminsk, Frank H.	New Bremen	*Ohio*
Larson, H. W.	Wilmont	*Minnesota*
Lenocker, H. F.	Dexter	Dallas
Long, R. E.	Bedford	Taylor
Mikkehern, A. C.	Fairmont	*Minnesota*
Mogle, J. T.	Freeport	*Illinois*
Moon, Chas. G.	Manson	Calhoun
Moser, Philip R.	Alta	Buena Vista
McCool, Jas.	Masonville	Deleware
McIntire, C. E.	Adair	Dallas
Olson, Chas.	Emmons	*Minnesota*
Palmer, F. R.	Hartwick	Poweshiek
Petersen, C. B.	Dannebrog	*Nebraska*
Peterson, P. M.	Spring Grove	*Minnesota*
Peterson, P. N.	Rake	Winnebago
Rantenkranz, R. F.	Turman	*Minnesota*
Remington, A. L.	Ruthven	Palo Alto
Rodgers, F. F.	Ames	Story
Ross, J. J.	Clarksville	Butler
Sallie, Jno.	Clarinda	Page
Schmidt, H. H.	Steamboat Rock	Hardin
Schuknecht, E. C.	Templeton	Carroll
Scott, Geo. F.	Magnolia	Harrison
Siebels, Geo.	Palmer	Pocahontas
Skitt, W. H.	Guthrie Center	Guthrie
Somerville, J. S.	Chicago	*Illinois*
Sorenson, Chris	Nevinville	Adams
Tegtmeier, John	Dewar	Black Hawk
Thuesen, Peter	Kimballton	Audubon
Wilson, W. J.	Earlham	Madison
Zimmerman, A. C.	Council Bluffs	Pottawattamie

Total—64.

ENROLLMENT FOR SHORT COURSE IN DOMESTIC SCIENCE.

NAME	TOWN	COUNTY
Britten, Ruby	Ames	Story
Campbell, Fae	Ames	Story
Childs, Vera	Ames	Story
Cornwell, Jennie M.	Ankeny	Polk
Dack, Mrs. Lester	Wyalusing	*Wisconsin*
Davis, Marinda	Clemons	Marshall
Field, Jessie	Clarinda	Page
Hays, Mary	Hamlin	Audubon
Henderson, Ida	Story	Story
Henderson, Josephine	Randall	Hamilton
Hoversten, Anna	Jewell	Hamilton
Hunter, Daisy B.	Ames	Story

Johnson, Sena	Jewell	Hamilton
Kiefer, Neva	Hazleton	Buchanan
Ladd, Jennie C.	Ankeny	Polk
Leversee, Mame	Cedar Falls	Black Hawk
Lyman, Sarah	Hartley	O'Brien
McBain, Mary	Ames	Story
Peters, Mabel C.	Sac City	Sac
Peterson, Mrs. Edward,	Stratford	Hamilton
Phillips, Lura	Cedar Falls	Black Hawk
Proudfit, Ada	Altoona	Polk
Proudfit, Ora	Altoona	Polk
Rabe, Maude	Alta Vista	Chickasaw
Schreiber, Nemily	Sibley	Osceola
Schultz, Louise	Ida Grove	Ida
Shuff, Mrs. F. K.	Ames	Story
Smith, Candace C.	Clemons	Marshall
Smith, Mrs. O. J.	Ames	Story
Stanfield, Alice	Ankeny	Polk
Steen, Dorothea	West Liberty	Muscatine
Tiffany, Mary	Story City	Story
Tjernagel, Bertha	Story City	Story
Tramel, Mary C.	Ira	Jasper
Turner, Vera	Colfax	Jasper
Tuttle, Mrs. C. E.	Cedar Rapids	Linn
Wiegman, Annie	Rolfe	Pocahontas

Total—37.

STUDENT ENROLLMENT AT IOWA STATE COLLEGE.

1907-1908.

Course	Post Grad.	Sr.	Jr.	Soph.	Fresh.	Acad.	Spl.	Total
Animal Husbandry	2	21	26	45	70	43	90	297
Agronomy		11	8	12	21	5	19	76
Dairy	1	4	2	5	5	3	2	22
Horticulture	3	5	6	8	12	5	5	44
Science and Agriculture					3	1	2	6
Agriculture	5				8	8	8	29
Veterinary		14	16	26	52			108
Mechanical Engineering		21	26	27	50	19	10	153
Civil Engineering		32	56	68	116	51	13	336
Electrical Engineering		32	40	47	120	61	1	301
Mining Engineering			7	10	17	7	7	48
Ceramics				1	3	1		5
Science	3	6	8	16	12	11	21	77
General and Domestic Science		15	6	28	23	9	11	92
Domestic Science		4	3	5	20	8	32	72
One Year Dairy								17
Total	14	165	204	298	532	232	221	1683

Students in College courses	1683
Winter Short course students	642
Special Music students	56
Grand total	2381

All students having ten hours or more below Freshman grade are lassified as Academic students. In a great number of cases, however, he greater part of their work is in the Freshman year. The total number of purely Academic students would, therefore, be considerably less than the above classification would indicate.

SUMMARY OF GRADUATES

		1908
Number of first degrees granted 1872-1908	1995	165
PRESENT COURSES		
Animal Husbandry Course, 1904-1908	95	23
Agronomy Course, 1905-1908	33	9
Horticultural Course, 1904-1908	18	5
Dairying Course, 1904-1908	20	4
Science and Agriculture Course, 1908	1	0
Veterinary, 1880-1908	167	14
Mechanical Engineering Course, 1872-1908	185	21
Civil Engineering Course, 1872-1908	296	32
Electrical Engineering Course, 1892-1908	226	31
Mining Engineering Course, 1897-1908	20	1
Science Course, as related to the Industries, 1875-1908	405	6
Domestic Science Course, 1908	6	4
General and Domestic Science Course, 1901-1908	78	15
COURSES DISCONTINUED		
Agricultural Course, leading to Degree B. S., 1872-1880	102	
Agricultural Course, leading to Degree B. S. A., 1883-1888 and 1899-1904	86	
Science and Agriculture Course, leading to Degree B. S., 1889-1890	45	
General Science Course for Ladies, 1872-1880 and 1904	48	
General and Domestic Science Course, leading to Degree of B. L., 1887-1899	93	
General and Domestic Science Course, leading to Degree of B. Ph., 1899-1900	21	
Agronomy Course, leading to Degree B. Ag., 1891-1898	50	
	1995	165

		1908
Higher Degrees, 1872-1908	120	13
Master of Scientific Agriculture	38	2
Master of Science	34	2
Other Masters' Degrees	11	
Engineers	24	8
Honorary Degrees	9	1
Advanced Degrees in Veterinary	4	

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of
Agriculture and Mechanic Arts

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Vol. VII BULLETIN No. 5

IOWA
STATE COLLEGE
OF
AGRICULTURE AND
MECHANIC ARTS

CATALOGUE NUMBER
FEBRUARY, 1909
AMES, IOWA

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Separate announcements of the Engineering, Agricultural and Veterinary Divisions as well as the College Catalogue, Compendium and Short Course announcements will be sent gratuitously to any one wishing them. In calling for announcements, please state the Division concerning which information is desired. Address all communications to A. B. Storms, President of Iowa State College, Ames, Iowa.

THE TORCH PRES
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CALENDAR—1909-1910

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Calendar for 1909-1910

1909.

SECOND SEMESTER.

January 19-20, Tuesday and Wednesday	Entrance Examinations.
January 21-23, Thursday, 8:00 A. M., to Saturday, 5:00 P. M.	Registration-Classification Days.
January 25, Monday, 7:45 A. M.	College Work begins.
January 30, Saturday, 8:00 P. M.	Joint Y. M. C. A. and Y. W. C. A. Reception.
February 12, Friday	Lincoln's Birthday, Holiday.
February 22, Monday, 9:30 A. M.	General Convocation of Students—Washington's Birthday.
March 1, Monday	Selection of Senior Honor Students.
March 13, Saturday, 8:00 P. M.	Freshman-Sophomore Annual.
March 31, Wednesday, 5:00 P. M.	Easter Vacation begins.
April 5, Monday, 7:00 P. M.	Easter Vacation closes.
April 9, Friday	Inter-society Declamatory Contest.
May 3, Monday	Recommendation of Candidates for Graduation.
May 15, Saturday	Last Date for Examination of Candidates for Master's Degree.
May 25, Tuesday	Last Day for Presenting Theses to Thesis Committee.
May 30, Sunday	Memorial Day.
June 4, Friday, 8:00 P. M.	Graduation Exercises of Literary Societies.
June 4, Friday	Civil and Mining Engineers go into Summer Camp.
June 5, Saturday, 8:00 P. M.	Semester Musical Recital
June 5, Saturday	Missouri Valley Conference Field Meet, Des Moines.
June 6, Sunday, 10:30 A. M.	Baccalaureate Sermon.
June 6, Sunday, 8:00 P. M.	Address before the Christian Associations.
June 7, Monday, 8:00 P. M.	Junior Class Play.
June 8, Tuesday, 2:30 P. M.	Senior Class Day Exercises.
June 8, Tuesday, 8:00 P. M.	Grand Concert.
June 9, Wednesday, 7:30 A. M.	Senior Breakfast.
June 9, Wednesday	Alumni Business Meeting.

June 9, Wednesday, 8:00 P. M.	Senior Promenade.
June 10, Thursday, 10:30 A. M.	Commencement Address and Presentation of Diplomas.
June 10, Thursday, 1:00 P. M.	Alumni and Faculty Banquet.
June 11, Friday	Summer Vacation begins.

1909.

FIRST SEMESTER.

August 31, September 1, Tuesday and Wednesday	Entrance Examinations.
September 2, Thursday, 7:45 A. M.	First Semester begins.
September 2-4, Thursday, 8:00 A. M., to Saturday, 5:00 P. M.	Registration and Classification Days.
September 6, Monday, 7:45 A. M.	College Work begins.
September 11, Saturday, 8:00 P. M.	Y. M. C. A. and Y. W. C. A. Reception.
October 2, Saturday, 8:00 P. M.	Junior Trot.
October 4, Monday	Last Date for Presentation of Subjects for Bachelor's Degree.
October 16, Saturday, 8:00 P. M.	Sophomore-Freshman Annual.
October 21, Thursday	College Day.
November 25-27, Thursday to Saturday	Thanksgiving Vacation.
December 21-22, Tuesday and Wednesday	Semester Examinations.
December 22, Wednesday, 5:00 P. M.	College Work closes.

1910.

January 3-15, Monday to Saturday	Special Short Courses in Agriculture and Domestic Economy.

1910.

SECOND SEMESTER.

January 18-19, Tuesday and Wednesday	Entrance Examinations.
January 20-22, Thursday, 8:00 A. M., to Saturday, 5:00 P. M.	Registration and Classification Days.
June 9, Thursday	Second Semester closes.

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Dean of the Division of Engineering. Room 315, Engineering Hall.

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Dean of the Division of Veterinary Medicine. Second Floor, Agricultural Hall.

MRS. MARIAN H. KILBOURNE, B. L.,
Dean of Women. Margaret Hall.

SPENCER A. BEACH, B. S. A., M. S.,
Vice Dean of the Division of Agriculture. First Floor, Agricultural Hall.

SAMUEL WALKER BEYER, Ph. D.,
Vice Dean of the Division of Engineering. Room 303, Engineering Hall.

MARIA M. ROBERTS, B. L.,
Vice Dean of the Junior College. Room 218, Central Building.

AGRICULTURAL EXPERIMENT STATION.

CHARLES FRANKLIN CURTISS, M. S. A., D. S.,
Director. First Floor, Agricultural Hall.

WILLARD JOHN KENNEDY, B. S. A.,
Vice Director. First Floor, Agricultural Hall.

ENGINEERING EXPERIMENT STATION.

ANSON MARSTON, C. E.,
Director. Room 315, Engineering Hall.

THE FACULTY ORGANIZATION.

ALBERT BOYNTON STORMS, LL. D.,
President, Chairman of Sifting and Public Grounds Committees. Room 104, Central Building.

HERMAN KNAPP, B. S. A.,
Secretary and Chairman of Committee on Catalogue and Diploma. Room 122, Central Building.

EDGAR WILLIAMS STANTON, LL. D.,
Chairman of Committee on Course of Study. Room 117, Central Building.

CHARLES FRANKLIN CURTISS, M. S. A., D. S.,
Chairman of Committee on Library. First Floor, Agricultural Hall.

ALFRED ALLEN BENNETT, M. S.,
Chairman of Committee on Examinations and Standings. Second Floor, Chemical Hall.

LOUIS HERMANN PAMMEL, Ph. D.,
Chairman of Committee on Theses. Room 314, Central Building.

LOUIS BEVIER SPINNEY, M. S.,
Chairman of Committee on Rules. Room 212, Engineering Hall.

SAMUEL WALKER BEYER, Ph. D.,
Chairman of Committee on College Athletics. Room 303, Engineering Hall.

HENRY ELIJAH SUMMERS, B. S.,
Chairman of Committee on Post Graduate Study. First Floor, Morrill Hall.

RICHARD CORNELIUS BARRETT, M. A., LL. B.,
Chairman of Committee on Entrance Requirements and Secondary Schools. Room 101, Central Building.

ARTHUR MAC MURRAY, B. A., M. O.,
Chairman of Committee on Literary Societies. Room 311½, Central Building.

LOLA A. PLACEWAY, B. S.,
Chairman of Committee on Time Table. Second Floor, Chemical Hall.

ORANGE HOWARD CESSNA, D. D.,
Chairman of Committee on Student Affairs. Room 212, Central Building.

M. L. BOWMAN, B. S. A.,
Chairman of Committee on Student Social Affairs. Second Floor. Agricultural Hall.

FRED ALAN FISH, M. E. in E. E.,
Chairman of Committee on General Faculty Meetings and Social Affairs. Room 212, Engineering Hall.

Officers of Instruction

THE FACULTY.

ALBERT BOYNTON STORMS, A. M., LL. D.,
President, Dean of the Division of Science, 1903.*

EDGAR WILLIAMS STANTON, M. S., LL. D.,
Dean of the Junior College, Professor of Mathematics, 1877, 1874.

CHARLES FRANKLIN CURTISS, M. S. A., D. S.,
Dean of the Division of Agriculture, Director of Experiment Station, 1897, 1891.

ANSON MARSTON, C. E.,
Dean of the Division of Engineering, Professor of Civil Engineering, 1892.

CHARLES HENRY STANGE, D. V. M.,
Dean of the Division of Veterinary Medicine, Professor of Veterinary Medicine and Surgery, 1909, 1907.

HON. JAMES WILSON, M. S. A.,
Lecturer in Agriculture, 1902, 1891.

GENERAL JAMES RUSH LINCOLN,
Professor of Military Science, 1884, 1883.

ALFRED ALLEN BENNETT, M. S.,
Professor of Chemistry, 1885.

LOUIS HERMANN PAMMEL, B. Ag., M. S., Ph. D.,
Professor of Botany and General Bacteriology, 1889.

MISS LIZZIE MAY ALLIS, A. M.,
Professor of Modern Languages, 1896.

LOUIS BEVIER SPINNEY, B. M. E., M. S.,
Professor of Physics and Electrical Engineering, 1897, 1893.

SAMUEL WALKER BEYER, B. S., Ph. D.,
Vice Dean of the Division of Engineering, Professor of Geology and Mining Engineering, 1898, 1891.

ALVIN BUELL NOBLE, B. Ph.,
Professor of Rhetoric and Literature, 1898.

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*First date after the title indicates the date of appointment to present position, the second date, when the first fails to do so, indicates the date of first appointment in the college.

HENRY ELIJAH SUMMERS, B. S.,
Professor of Zoology, 1898.

ORANGE HOWARD CESSNA, A. M., D. D.,
Professor of History and Psychology, 1900.

WILLARD JOHN KENNEDY, B. S. A.,
Professor of Animal Husbandry, 1901.

WILLIAM HENRY STEVENSON, A. B., B. S. A.,
Professor of Soils, 1903, 1902.

RICHARD CORNELIUS BARRETT, A. M., LL. B.,
Professor of Civics, 1904.

SPENCER A. BEACH, B. S. A., M. S.,
Vice Dean of the Division of Agriculture, Professor of Horticulture,
1905.

BENJAMIN H. HIBBARD, B. Ag., Ph. D.,
Professor of Economic Science, 1906, 1902.

WARREN H. MEEKER, M. E.,
Professor of Mechanical Engineering, 1907, 1891.

FRED ALAN FISH, M. E. in E. E.,
Professor of Electrical Engineering, 1907, 1905.

J. BROWNLEE DAVIDSON, B. S., M. E.,
Professor of Agricultural Engineering, 1907, 1905.

MRS. ALICE DYNES FEULING, B. S.,
Professor of Domestic Economy, 1907.

ARTHUR MAC MURRAY, B. A., M. O.,
Professor of Public Speaking, 1908.

M. L. BOWMAN, B. S. A.,
Professor of Farm Crops, 1908, 1905.

MISS MARIA M. ROBERTS, B. L.,
ice Dean of Junior College, Associate Professor of Mathematics,
1904, 1891.

ARTHUR THOMAS ERWIN, B. S., M. S. A.,
Associate Professor of Horticulture, 1904, 1900.

MISS LOLA ANN PLACEWAY, B. S.,
Associate Professor of Chemistry, 1905, 1896.

MISS VINA ELETHE CLARK,
Librarian, 1897.

MRS. MARIAN H. KILBOURNE, B. L.,
Dean of Women and Instructor in History of Art, 1900.

JOHN PIPER WATSON,
Physical Director, 1904.

C. B. STANTON, C. E.,
Associate Professor in Railway Engineering, 1907.

IRA ABRAHAM WILLIAMS, M. S., A. M.,
Associate Professor of Geology and Mining Engineering, 1907, 189

J. E. KIRKHAM, B. C. E.,
Associate Professor in Structural Engineering, 1907.

WINFRED F. COOVER, A. M.,
Associate Professor of Chemistry, 1907, 1904.

WAYNE DINSMORE, B. S. A.,
Associate Professor of Animal Husbandry, 1907, 1903.

R. R. DYKSTRA, D. V. M.,
Associate Professor of Anatomy and Obstetrics, 1907, 1905.

LAURENCE C. HODSON, B. C. E., E. M.,
Associate Professor of Mining Engineering, 1907, 1906.

MISS HELEN DONOVAN,
Associate Professor of Domestic Economy, 1907, 1906.

CHARLES A. SCOTT, B. S. A.,
Associate Professor of Forestry, 1908.

HERMAN KNAPP, B. S. A.,
Registrar, 1887, 1883.

MISS CAROLYN GRIMSBY, B. S.,
Reference Librarian, 1908, 1905.

MISS ELIZABETH MACLEAN, M. Di.,
Associate Professor of English, 1908, 1899.

MARK PERKINS CLEGHORN, B. S. in E. E., M. E.,
Associate Professor of Mechanical Engineering, 1908, 1902.

ADOLPH SHANE, B. S. in E. E., E. E.,
Associate Professor of Electrical Engineering, 1908, 1904.

ROBERT EARLE BUCHANAN, M. S.,
Associate Professor of General Bacteriology, 1908, 1904.

CHARLES C. MAJOR, M. E.,
Associate Professor of Mechanical Engineering, 1908.

MARTIN MORTENSEN, B. S. A.,
Associate Professor of Dairying, 1908.

ASSISTANT PROFESSORS.

ALEXANDER STEWART THOMPSON,
Director of Music, Piano, Pipe Organ and Voice, 1907.

CLARA DUTTON THOMPSON,
Vice-Director, Voice, Preparatory Piano and Organ, 1907.

JOSEPH EDWARD GUTHRIE, M. S.,
Assistant Professor of Zoology, 1904, 1902.

THOMAS HARRIS MACDONALD, B. C. E.,
Assistant Professor of Civil Engineering in Charge of Good Road Investigations, 1905, 1904.

ERNEST ALANSON PATTENGILL, B. S.,
Assistant Professor of Mathematics, 1906, 1900.

MISS JULIA COLPITTS, A. M.,
Assistant Professor of Mathematics, 1906, 1900.

FRANK GILBERT ALLEN, B. S. in M. E.,
Assistant Professor of Mechanical Engineering, 1906, 1904.

HUGH G. VAN PELT, B. S. A.,
Assistant Professor of Animal Husbandry and Superintendent of Dairy Farm, 1906.

LOUIS BERNARD SCHMIDT, A. M.,
Assistant Professor of History, 1906.

MISS RUTH MORRISON, B. Ph.,
Assistant Professor of Domestic Economy, 1907, 1903.

ROY A. NORMAN, B. M. E.,
Assistant Professor of Mechanical Engineering, 1907.

HOWARD C. FORD, C. E.,
Assistant Professor of Surveying and Irrigation, 1907.

A. H. HOFFMAN, B. S. in E. E.,
Assistant Professor of Physics, 1907, 1905.

W. B. ANDERSON, M. S., Ph. D.,
Assistant Professor of Physics, 1907, 1905.

JOHN BOWER, B. S. A.,
Assistant Professor of Dairying, 1906.

WILLIAM E. MADSON, D. V. M.,
Assistant Professor of Physiology and Sanitary Science, 1907.

*MISS ELIZABETH MOORE, Ph. M.,
Assistant Professor of English, 1908, 1904.

MISS SYBIL LENTNER, B. S.,
Assistant Professor of Public Speaking, 1908, 1904.

MISS WINIFRED TILDEN, B. A.,
Physical Directoress, 1908, 1904.

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* Leave of absence for the year 1909-10.

MISS DORA GILBERT TOMPKINS, A. M.,
Assistant Professor of English, 1908, 1905.

MISS JULIA RAMSEY VAULX, A. M.,
Assistant Professor of English, 1908, 1906.

H. C. PIERCE,
Assistant Professor of Animal Husbandry in Charge of Poultry
1908, 1906.

ROY HIRAM PORTER, B. M. E.,
Assistant Professor of Mechanical Engineering, 1908, 1906.

M. I. EVINGER, B. C. E.,
Assistant Professor of Civil Engineering, 1908, 1906.

HARRY G. BELL, B. S. A.,
Assistant Professor of Farm Crops, 1908, 1907.

B. W. CROSSLEY, B. S. A.,
Assistant Professor of Farm Crops, 1908, 1907.

JOHN E. BRINDLEY, A. M.,
Assistant Professor of Economic Science, 1908, 1907.

MISS BERTHA MOORE,
Assistant Professor of Domestic Economy, 1908.

HAROLD E. BEMIS, D. V. M.,
Assistant Professor in Veterinary Science, 1908.

INSTRUCTORS.

EZRA CORNELIUS POTTER,
Instructor in Pattern Shop, 1898.

MISS ANNIE FLEMING, B. S.,
Instructor in Mathematics, 1900.

MISS GRACE ISABEL NORTON, B. A.,
Instructor in German, 1901.

WARD MURRAY JONES, B. C. E.,
Instructor in Mathematics, 1902.

JESSE GREENLEAF HUMMEL, B. M. E.,
Instructor in Machine Shop, 1903.

MISS ESTELLE DENNIS FOGEL, B. A., B. S.,
Instructor in Botany, 1905, 1904.

EDWARD MERRITT SPANGLER,
Instructor in Pattern Shop, 1905, 1904.

C. E. BARTHOLOMEW, M. S.,
Instructor in Entomology, 1905, 1904.

MISS ETHYL CESSNA, B. S.,
Instructor in History, 1905, 1904.

MISS LOLA STEPHENS, B. S.,
Instructor in Chemistry, 1906, 1905.

CHARLES E. ELLIS, M. S. A.,
Instructor in Mining Engineering, 1906, 1903.

MISS LOUISE PETERS, A. M.,
Instructor in German and Spanish, 1907.

W. R. RAYMOND, A. B.,
Instructor in English, 1907.

MISS INGEBORG LOMMEN, M. L.,
Instructor in German, 1907.

MISS LAURA TAGGART, B. S.,
Instructor in Chemistry, 1907, 1906.

MISS MELISSA FLYNN, B. S.,
Instructor in Chemistry, 1907, 1906.

WILLIAM KUNERTH, A. B.,
Instructor in Physics, 1907.

E. W. HAMILTON, B. S. A.,
Instructor in Agricultural Engineering, 1907.

MISS HELEN F. SMITH, A. B.,
Instructor in Mathematics, 1907.

MISS MABEL CAMPBELL, B. S.,
Instructor in Domestic Economy, 1907, 1906.

ROY WINCHESTER CRUM, B. C. E.,
Instructor in Civil Engineering 1907.

MISS FREDRICA V. SHATTUCK, A. B.,
Instructor in Public Speaking, 1907.

JOSEPH B. VARELA,
Instructor in Mechanical Drawing, 1907.

JOSEPH FREDERICK BARKER, B. S. A.,
Instructor in Soils, 1908.

THEODORE RAY MINERT, B. M. E.,
Instructor in Mechanical Drawing, 1908.

EDWARD N. WENTWORTH, B. S. A.,
Instructor in Animal Husbandry, 1908, 1907.

LAURENZ GREEN, B. S.,
Instructor in Horticulture, 1908, 1907.

JOHN T. BATES, B. M. E.,
Instructor in Mechanical Laboratory, 1908, 1907.

MISS MABEL RUNDALL, B. S.,
Instructor in English, 1908, 1907.

J. W. CAMERON,
Instructor in Forge Work, 1908, 1907.

JOHN SAWIN,
Instructor in Foundry, 1908, 1907.

WALTER H. PETERS, B. S. A.,
Instructor in Animal Husbandry, 1908.

MISS AGNES G. MOSHER, B. S.,
Instructor in Mathematics, 1908.

MISS CARRIE WATTERS, A. B.,
Instructor in History, 1908.

WARREN D. FOSTER, Ph. B.,
Instructor in English, 1908.

MRS. MARY P. FAIRFIELD, A. B.,
Instructor in French, 1908.

MRS. D. A. ARVILLE, A. B.,
Instructor in Spanish and French, 1908.

MISS GEORGINA VAN AUKEN,
Instructor in Violin and Stringed Instruments, 1908.

DELBERT WHEELER, B. C. E.,
Instructor in Civil Engineering, 1908.

MISS MARY MAKEPEACE MORRIS, Ph. B.,
Instructor in English, 1908.

MISS MARIE ZIMMERMAN, A. B.,
Instructor in German, 1908.

MISS RUTH BOGARDUS SAFFORD, B. L.,
Instructor in English, 1908.

MYRICK W. PULLEN, B. S. in E. E.,
Instructor in Physics and Electrical Engineering, 1908.

HENRY H. KILDEE, B. S. A.,
Instructor in Animal Husbandry, 1908.

RESIDENT LECTURERS.

GEORGE JUDISCH,
Lecturer on Pharmacy, 1901.

ASSISTANTS.

MISS HARRIETTE KELLOGG, A. M.,
Curator of the Herbarium, 1903.

HENRY NESS, B. S.,
Assistant in Zoology, 1906.

GEORGE MITCHELL,
Farm Foreman, 1906.

MARGARET FORGEUS, A. B.,
Library Cataloguer, 1906.

ORMA J. B. SMITH, B. S.,
Assistant in Horticulture, 1907.

MISS CAROLINE LAIRD,
Assistant Librarian, Engineering Library, 1907.

MISS LILLIAN M. LISTER, B. S.,
Assistant in Chemistry, 1907.

R. E. CARR,
Assistant in Agricultural Engineering, 1907.

R. W. GETCHELL, B. S. A.,
Assistant in Chemistry, 1907.

CHARLES L. MUNDHENK,
Brass Instruments, 1906.

ROYAL EDGAR JEFFS, B. S. A.,
Assistant in Botany, 1907.

MRS. EMMA CUNNINGHAM,
Matron Margaret Hall, 1907.

A. H. CHADSEY,
Refrigeration Engineer Dairy Department, 1907.

MISS ADA HAYDEN, B. S.,
Assistant in Botany, 1908, 1906.

MISS VERA M. DIXON, B. S.,
Assistant Librarian General Library, 1908.

MISS FLORENCE A. ARMSTRONG,
Assistant in English, 1908.

C. V. GREGORY,
Assistant in Agricultural Journalism, 1908.

THOMAS E. CULP,
Assistant in Dairying, 1908.

D. W. SYLVESTER,
Assistant in Agricultural Engineering, 1908.

F. W. MEYER,
Gardener, 1908.

A. L. BAKKE, B. S.,
Assistant in Botany, 1908.

F. G. CHURCHILL,
Assistant in Chemistry, 1908.

STUDENT ASSISTANTS.

JESSE McKEEN,
Student Laboratory Assistant in Chemistry, 1907.

MISS EMMA WENNHOLZ,
Student Assistant in German, 1908.

MISS EDNA EVERETT,
Student Assistant in English, 1908.

W. A. LIPPINCOTT,
Student Assistant in Poultry Husbandry, 1908.

CHARLES MURRAY,
Student Assistant in Botany, 1908.

C. R. SHUMWAY,
Student Assistant in Zoology, 1908.

RAY WEIRICK,
Student Assistant in Civil Engineering, 1908.

Agricultural Experiment Station Staff

ALBERT BOYNTON STORMS, A. M., LL. D.,
President Ex-Officio.

CHARLES FRANKLIN CURTISS, M. S. A., D. S.,
Director.

WILLARD JOHN KENNEDY, B. S. A.,
Vice Director and Animal Husbandry.

LOUIS HERMANN PAMMEL, B. Ag., M. S., Ph. D.,
Botanist.

HENRY ELIJAH SUMMERS, B. S.,
Entomologist.

WILLIAM HENRY STEVENSON, A. B., B. S. A.,
Soils.

LOUIS G. MICHAEL, B. S.,
Chemist.

SPENCER A. BEACH, B. S. A., M. S.,
Horticulturist.

ARTHUR T. ERWIN, B. S., M. S. A.,
Assistant Horticulturist.

J. BROWNLEE DAVIDSON, B. S., M. E.,
Agricultural Engineering.

M. L. BOWMAN, B. S. A.,
Farm Crops.

CHARLES A. SCOTT, B. S. A.,
Forester.

MARTIN MORTENSEN, B. S. A.,
Dairying.

EDWIN ELIAS LITTLE, M. S. A.,
Assistant Horticulturist.

IRA OBED SCHAUB, B. S.,
Assistant in Soils.

HUGH G. VAN PELT, B. S. A.,
Assistant in Animal Husbandry.

MISS CHARLOTTE KING,
Assistant in Botany.

MISS HARRIETTE KELLOGG, A. M.,
Assistant in Botany.

E. T. ROBBINS, B. S. A.,
Assistant in Animal Husbandry.

MATT L. KING, B. M. E.,
Experimentalist in Agricultural Engineering.

JOHN BOWER, B. S. A.,
Assistant in Dairying.

ROBERT E. BUCHANAN, M. S.,
Bacteriologist.

F. E. COLBURN,
Photographer.

H. C. PIERCE,
Poultry.

C. H. STANGE,
Veterinary.

L. C. BURNETT, M. S. A.,
Assistant in Farm Crops.

ROBERT LOVENZO WEBSTER,
Assistant in Entomology.

JUDSON H. CRISWELL, B. S.,
Assistant in Farm Crops.

STELLA HARTZELL, A. M.,
Assistant Chemist.

ORMA J. B. SMITH, B. S.,
Assistant in Horticulture.

B. A. MADSON, B. S. A.,
Assistant Chemist.

C. V. GREGORY.
Editor, Station Bulletins.

T. J. MANEY,
Assistant Chemist.

W. A. LIPPINCOTT,
Assistant in Poultry.

Engineering Experiment Station

STATION COUNCIL.

(Appointed by the Board of Trustees.)

ALBERT BOYNTON STORMS, A. M., LL. D.,
President.

ANSON MARSTON, C. E.,
Director.

LOUIS BEVIER SPINNEY, B. M. E., M. S.,
SAMUEL WALKER BEYER, B. S., Ph D,
WARREN H. MEEKER, M. E.,
Professors.

ENGINEERING EXPERIMENT STATION STAFF.

ALBERT BOYNTON STORMS, A. M., D. D., LL. D.,
President, Ex-Officio.

ANSON MARSTON, C. E.,
Director and Civil Engineer.

LOUIS BEVIER SPINNEY, B. M. E., M S,
Electrical Engineer.

SAMUEL WALKER BEYER, B. S., Ph. D.,
Mining Engineer.

WARREN H. MEEKER, M. E.,
Mechanical Engineer.

ALFRED ALLEN BENNETT, M. S.,
Chemist.

C. E. ELLIS, M. S A,
Assistant Chemist.

IRA ABRAHAM WILLIAMS, M. S., A. M.,
Assistant in Engineering Experiment Station.

F. M. OKEY, B. C. E.,
Assistant in Engineering Experiment Station.

Iowa Highway Commission

Section 1, Chapter 105 of the Laws of 1904 provides that the Iowa State College of Agriculture and Mechanic Arts shall act as a Highway Commission for the State of Iowa.

HIGHWAY COMMISSION STAFF.

ANSON MARSTON, C. E.,
CHARLES FRANKLIN CURTIS, M. S. A.,
Directors.

THOS. H. MACDONALD, B. C. E.,
Highway Engineer.

J. BROWNLEE DAVIDSON, B. S., M. E.,
Engineer of Road Machinery.

Agricultural Extension

ALBERT BOYNTON STORMS, A. M., LL. D.,
President, Ex-Officio.

CHARLES FRANKLIN CURTISS, M. S. A.,
Dean of Agriculture, Ex-Officio.

AGRICULTURAL EXTENSION STAFF.

PERRY GREELEY HOLDEN, M. S., B. Pd.,
Superintendent.

A. V. STORM, Ph. B,
Schools.

RALPH K. BLISS, B. S. A.,
Animal Husbandry.

ADDISON H. SNYDER, B. S.,
Soils.

R. E. DRENNAN, B. S. A.,
Animal Husbandry.

MISS EDITH G. CHARLTON,
Domestic Economy.

MISS NEALE S. KNOWLES,
Domestic Economy.

GEORGE R. BLISS, B. S. A.,
Horticulture.

HERMAN C. HORNEMAN, B. S. A.,
Dairying.

A. E. NELSON,
Farm Crops.

H. C. PIERCE,
Poultry,

Organization and History

The laws of the State of Iowa provide for a Board of Trustees, consisting of the Governor and the Superintendent of Public Instruction, both Ex-Officio, and for one member from each Congressional District, elected by the General Assembly. The Board of Trustees shall manage and control the Iowa State College at all times supporting the best interest of the institution.

The act establishing "A State Agricultural College and Model Farm" to be connected with the entire agricultural interests of the State was passed by the Legislature of Iowa in 1858. This legislature also appointed a board of commissioners to buy a farm and erect a college building, and elected a board of trustees to select a faculty and organize a college.

In 1859 a farm of six hundred and forty acres situated near Ames was purchased for the use of the college.

In 1862 a bill was passed by Congress, entitled, "An act donating public lands to the several States and Territories, which may provide colleges for the benefit of Agriculture and the Mechanic Arts."

Section 1 of this act provides that for the support of such colleges there be granted "an amount of public land, to be apportioned to each State in quantity equal to thirty thousand acres for each Senator and Representative in Congress to which the States are respectively entitled by the apportionment under the census of 1860; provided that no mineral lands shall be selected or purchased under the provisions of this act."

Section 4 requires: "That all moneys derived from the sale of land aforesaid by the States to which lands are apportioned, and from the sale of land script, hereinbefore provided for, shall constitute a perpetual fund, the capital of which shall remain forever undiminished (except as may be provided for in Section fifth of this act), and the interest of which shall inviolably be apportioned by each State which may take and claim the benefit of this act, to the endowment, support and maintenance of at least one college, where the leading object shall be without excluding other scientific and classical studies, and including military tactics, to teach such branches of learning as are related to agriculture and the mechanic arts, in such manner as the Legislature of the State may provide, in order to promote the liberal and practical education of the industrial classes in the several pursuits and professions of life."

Section 5 says: "And be it further enacted, that the grant of land and land script hereby authorized, shall be made on the following conditions, to which, as well as the provisions hereinbefore contained, the previous assent of the several States shall be signified by legislative acts; first, if any portion of the fund, invested as provided by the foregoing section, or any portion of the interest thereon, shall, by any action or contingency, be diminished or lost, it shall be replaced by the State to which it belongs; so that the capital of the fund shall remain forever undiminished; and the annual interest shall be regularly applied without diminution to the purposes mentioned in the fourth section of this act, except that a sum not exceeding ten per centum upon the amount received by any State under the provisions of this act may be expended for the purchase of land for sites or experimental farms, wherever authorized by the respective Legislatures of said States. Second, no portion of said fund nor the interest thereon shall be applied, directly or indirectly, under any pretense whatever, to the purchase, erection, preservation or repair of any building or buildings."

The General Assembly of Iowa, September 11, 1862, accepted the grant upon the conditions and under the restrictions contained in the act of Congress, and by so doing entered into contract with the General Government to erect and keep in repair all buildings necessary for the use of the College. By this action of the General Assembly the College was changed from an agricultural institution into a College of Agriculture and Mechanic Arts with the broad and liberal course of study outlined in the following paragraph.

In 1882 the General Assembly passed an act defining the course of study to be pursued as follows: Section 1. That Section 1621 of the Code is hereby repealed and the following is enacted in lieu thereof: "Section 1621. There shall be adopted and taught in the State Agricultural College, a broad, liberal and practical course of study, in which the leading branches of learning shall relate to agriculture and the mechanic arts, and which shall also embrace such other branches of learning as will most practically and liberally educate the agricultural and industrial classes in the several pursuits and professions of life, including military tactics. Section 2. That all acts, and parts of acts inconsistent with this act are hereby repealed."

August 30th the following act was approved by President Harri- on: "Be it enacted by the Senate and House of Representatives f the United States in Congress assembled, that there shall be and ereby is, annually appropriated, out of any moneys in the treasury ot otherwise appropriated, arising from the sales of public lands, o be paid as hereinafter provided, to each State and Territory for he more complete endowment and maintenance of colleges for the enefit of agriculture and the mechanic arts now established, or hich may hereafter be established, in accordance with an act of

Congress approved July second, eighteen hundred and sixty-two, the sum of fifteen thousand dollars for the year ending June thirtieth, eighteen hundred and ninety, and an annual increase of the amount of such appropriation thereafter for ten years by an additional sum of one thousand dollars over the preceding year, and the annual amount to be paid thereafter to each State and Territory shall be twenty-five thousand dollars, to be applied only to instruction in agriculture, the mechanic arts, the English language and the various branches of mathematical, physical, natural and economic sciences, with special reference to their application in the industries of life, and to facilities for such instruction."

The income of the College from National and State sources is therefore expended in instruction, experimentation and illustration in agriculture and in the mechanic arts, and in underlying and related science and literature.

All buildings are erected and all repairs thereon are made by the State of Iowa, the cost down to date being about $1,250,000.

The College was formally opened on the 17th of March, 1869.

THE SCOPE.

The Iowa State College of Agriculture and Mechanic Arts seeks to aid the young men and women in the acquirement of a higher education. Instruction is given in the culture studies and sciences, together with such experimental work as to enable the students successfully to engage in a practical profession. Throughout the several courses, the study of the textbook is supplemented by lectures, discussions, library work, and the practical experimental work of the laboratory. The instruction is not merely theoretical but also practical—the student verifying and putting into practice in the laboratory the instruction received.

The Iowa State College offers four five year courses and fourteen four year courses leading to the following degrees:

FIVE YEAR COURSES.

Five year course in Mechanical Engineering, leading to the degree of Bachelor of Science (Mechanical Engineering), B. S. (M. E.).

Five year course in Civil Engineering, leading to the degree of Bachelor of Science (Civil Engineering), B. S. (C. E.).

Five year course in Electrical Engineering, leading to the degree of Bachelor of Science (Electrical Engineering), B. S. (E. E.).

Five year course in Mining Engineering, leading to the degree of Bachelor of Science (Mining Engineering), B. S. (E. M.).

FOUR YEAR COURSES.

Course in Agronomy, leading to the degree of Bachelor of Science (Agronomy), B. S. (Agn.).

Course in Dairying, leading to the degree of Bachelor of Science (Dairying), B. S. (Dairying).

Courses in Animal Husbandry, leading to the degree of Bachelor of Science (Animal Husbandry), B. S. (A. H.).

Course in Horticulture and Forestry, leading to the degree of Bachelor of Science (Horticulture and Forestry), B. S. (Hort. and For.).

Course in Agricultural Engineering, leading to the degree of Bachelor of Science (Agricultural Engineering), B. S. (A. E.).

Course in Science and Agriculture, leading to the degree of Bachelor of Science (Science and Agriculture), B. S. (Sci. and Agr.).

Course in Veterinary Medicine, leading to the degree of Doctor of Veterinary Medicine (D. V. M.).

Course in Mechanical Engineering, leading to the degree of Bachelor of Science (Mechanical Engineering), B. S. (M. E.).

Course in Civil Engineering, leading to the degree of Bachelor of Science (Civil Engineering), B. S. (C. E.).

Course in Electrical Engineering, leading to the degree of Bachelor of Science (Electrical Engineering), B. S. (E. E.).

Course in Mining Engineering, leading to the degree of Bachelor of Science (Mining Engineering), B. S. (E. M.).

Course in Ceramics, leading to the degree of Bachelor of Science (Ceramics), B. S. (Cer.).

Course in General Science, leading to the degree of Bachelor of Science (B. S.).

Course in Domestic Economy, leading to the degree of Bachelor of Science (Domestic Economy), B. S. (D. E.).

Two year courses are also offered in Mining Engineering and Clay Working, and a one year course in Poultry Husbandry, for the completion of which, certificates will be given. That many, who are unable to take the full college course, may take advantage of the advancement being made in their chosen work, a two weeks' short course is now offered each year during the winter vacation in Stock and Grain Judging and Dairying. A School of Good Road Investigations is also held during each summer vacation. The interest in all of these short courses is becoming greater, the attendance is increasing, and the benefits to be derived from them are constantly increasing.

LOCATION.

The College occupies a delightful and healthful location upon high rolling land in the west part of Ames, Story County. Situated at the junction of the north and south branch and the main double-track line of the Chicago & Northwestern Railroad and connected with all the trunk lines of Iowa, Ames is easily accessible from all parts of the State. An electric railway connects Ames and the College with efficient service. The Ft. Dodge, Des Moines & Southern Ry. (electric), with stations on th College Campus, gives excellent connections with Des Moines and Fort Dodge, and with all of the trunk lines.

Ames is a most desirable town for wholesome college influences. Its people are thrifty, enterprising and cordial. The town has an excellent system of public schools, numerous churches, water works, electric lights and a good city government. It is an inviting community for families who wish to educate their children, enjoy the better elements of society and an environment of reasonable expense. Ames and the College are on very cordial terms, and its citizens seek to promote the efforts of the students and the highest interest of the College.

THE COLLEGE GROUNDS.

Of the entire College domain of 1200 acres, 125 acres are set apart for College grounds. These include the experimental plots, the young forestry plantations, the surroundings of the professors' dwellings and the central campus with its beautiful winding walks and drives, its trees, shrubbery and flower gardens, and its large and stately college buildings. The true principles of landscape gardening have been so faithfully observed in the gardening and in the location of buildings and drives as to make the entire campus a large and beautiful park.

BUILDINGS.

Twenty-seven commodious buildings have been erected by the State for the exclusive use of the various departments of the College, besides the dwelling houses and buildings for farm stock, machinery and work. All of these buildings are heated by steam, lighted by electricity, and supplied with pure water.

Central Building: The new Central Building which has been erected on the site of the Old Main accommodates the Executive Offices, the departments of English, Civics, Modern Languages, Economic Science, History, Mathematics, Public Speaking, Botany and General Bacteriology. The building is of buff Bedford stone, built in the Roman Renaissance style, which style has also been adopted for the Engineering and new Agricultural Halls. The building completed and furnished cost about $375,000.00.

Engineering Hall: The Engineering Departments occupy the new Engineering Hall. This is a fire-proof building in which all the engineering departments have offices, recitation and lecture rooms, laboratories and engineering museum. It is of Bedford stone, has plate glass windows, and modern conveniences and furnishings throughout. This building, costing $220,000.00, is the best engineering building west of the Mississippi river.

Engineering Annex: This is a two story fire-proof building, 50 feet by 208 feet, contract for which is let, the structure to be finished by September 1st, 1909. The total cost is $30,000. The first story will be devoted to the use of the Electrical Engineering Department, the Mining Engineering Department and the Surveying Department. In it will be located the dynamo engineering laboratory, assaying and clay working rooms for the Mining Engineering Department, and instrument room and class room for the Surveying Department. The second story will contain additional rooms for the Mining Engineering Department, the remainder being given up to drafting rooms and class rooms for the Electrical Engineering Department and the Civil and Mechanical Engineering Departments.

Agricultural Hall: The new Agricultural Hall will be completed and fully equipped for use at the opening of the next college year, September 1, 1909.

The building is 234x78 feet, and four stories in height. It is fireproof throughout and of the best modern construction, and will be arranged with suitable conveniences and facilities for thoroughly efficient high-grade work in agricultural instruction and investigation. This building, with its equipment complete, will cost about $275,000.00.

Agricultural Annex: The assembly room of the new Agricultural Hall is semi-circular in form, the base being ninety-six feet in diameter. The annex is fire-proof throughout and of the best modern construction. This annex, with its equipment, will cost about $75,000.

Agricultural Engineering Hall: This is a four story building, the lower stories of stone and the upper of brick. It contains recitation rooms of the divisions of Agriculture and Veterinary Science, offices of the Experiment Station and sewing rooms of the Domestic Economy department.

Agricultural Engineering Annex: This is a four story, fire-proof building, built of steel and pressed brick, costing when equipped about $70,000.00. It accommodates the workshops, tool rooms, blacksmith shop, carpenter shop, drafting room, reading room, rooms for the study and exhibition of various farm implements, offices and class rooms, bulletin rooms and a photographic department.

Morrill Hall: Morrill Hall, one of the oldest of the College buildings, was named in honor of Hon. Justin S. Morrill, the originator of the "Land Grant" for Colleges of Agriculture and Mechanic Arts. It is of deep red brick with stone, brick and terra cotta trimmings. In it are the College Chapel, Library and Zoological Museum, lecture rooms and laboratories.

Margaret Hall: Margaret Hall, the home of the young women of the College, occupies one of the most pleasing locations on the campus. It is built of brick, roofed with slate, provided with steam heat, electric lights, baths and large parlor. The hall will accommodate about one hundred girls, to whom the rooms will be assigned in the order of their application. The privilege of rooming in Margaret Hall is reserved for regular students. In connection with the Hall there are two clubs at which the girls may obtain board at a reasonable rate. Young women residents of Margaret Hall are required to board in one of these clubs. The young women are under the direction of an efficient dean of women. The department of Domestic Economy is also located in this building.

Dairy Building: This is a three story building built of pressed brick, trimmed with Bedford stone, containing factory, butter and cheese rooms, bottling room, refrigerators, lunch room, offices, research laboratory, farm dairy room, students testing laboratory, lecture room, dairy reading room, and bacteriological laboratory for research and investigation.

Chemical Hall: A three story brick building furnished with steam heat, water, gas and laboratory equipment, accommodating 600 students in Chemistry.

New Machine Shop: This is an entirely new building, 150x45 feet, just erected. It is practically two stories high, and besides a large machine shop, surrounded by a gallery, it contains laboratory, locker room, office, class room and tool room. This building is one of the best college engineering shops in the country.

Station Barn: The Experiment Station barn is one of the best and most modern buildings of its kind to be found anywhere in the world. It is veneered with buff pressed brick, has a slate roof, paved brick floors, and is in every respect entirely fire proof. The building is devoted to the housing of beef and dairy cattle and horses, for storage of vehicles and machinery, storage and grinding room for feed, seed rooms for the drying of corn and the storage of grain and feed stuffs used in experimental work.

Judging Pavilion: In connection with the experimental barn is a two story octagonal judging pavilion. It is built of buff pressed brick with a slate roof. The lower story is used for stock judging, and the upper for grain judging. This building, thoroughly equipped in every way, is conceded to be the best building of its kind on the continent.

Horticultural Laboratory: This is a two story brick building connected with the greenhouse. The main floor, accommodating fifty students, is especially fitted for the study of fruits. The building is equipped with two refrigerators, one for experimental work in cold storage and the other for storing fruits for class purposes. The second floor contains the horticultural museum and facilities for photography.

Greenhouses: The present plant contains 10,000 square feet under glass. The houses are of cypress construction, supported by a steel structure. They are heated by steam, operated on the Paul system, with varying temperatures for the propagating house, growing houses, and seed testing houses. The houses also include four commodious work rooms used in potting, transplanting and other necessary work.

Structural and Hydraulic Laboratory: This is a three story stone and brick building, which has been entirely remodeled and rebuilt into a modern laboratory building, fire proof except the roof. The Hydraulic laboratory occupies a basement wing lined with enamelled brick, together with the floor above it. There are also three large structural laboratory rooms, four computing and research rooms, and five instrument rooms and offices. The surveying department occupies the top floor of this building temporarily.

Power Station: This is a one story brick building, 36x120, devoted to the lighting and pumping plants of the College, and to the heating plant for the engineering buildings. All of the equipment is used for purposes of instruction, as far as this does not interfere with its other uses. In this way quite extensive equipment for steam and gas engine laboratory work is made available. The building contains an engine and dynamo room, a boiler room and a pump room.

Foundry: This is a one story brick building, 38x78 feet, containing the equipment for instruction in foundry practice. The roof trusses are of steel and calculated to carry traveling cranes for transferring heavy castings and forgings.

New Forge Shop: This is a one story brick building, 38x78 feet, with a store room at one side in an addition. The building was constructed in 1906. It contains equipment for construction in forge shop practice. The roof trusses are of steel and the roof is of slate.

Pattern Shop: This is a one story brick building, 38x120 feet, devoted to the work of instruction in bench work, wood turning and pattern work. A fire proof room is provided for the storage of patterns.

Locomotive Laboratory: For the temporary protection of the locomotives donated to the Department of Mechanical Engineering by the Chicago & Northwestern railway and by the estate of S. H. Mallory, a corrugated iron structure has been provided.

Veterinary Hospital: This is a three story brick building, containing offices and dissecting rooms, and is well equipped for conducting clinical as well as general hospital work.

Horse Barns and Stock Pavilion: The barn, built of brick, with a slate roof, is for horses, the storage of grain and general farm purposes. The Stock Pavilion is also of brick, is circular in form, well heated and lighted, accommodates several hundred students at a time, and affords first class advantages for stock judging and animal husbandry.

Sanitary Hall: A two story brick building, containing offices, kitchen and dining room for the hospital patients, and rooms for the sick and convalescent.

Music Hall: This is a two story brick building, fitted up with apparatus and instruments for practice and instruction.

Central Heating Plant: A central heating and power plant furnishes heat and power for all College purposes with very satisfactory results in comfort, economy and cleanliness.

Dwelling Houses: There are also on the campus eighteen comfortable dwelling houses occupied by professors' families, and by foremen and employees.

Other Buildings: Stables, barns, sheep and swine and seed houses sufficient for the requirements of the farm, are conveniently grouped near the College campus.

Admission to the College

Methods of Admission.

Students are admitted upon the presentation of a certificate from schools or colleges, or by examination at the College.

Admission by Certificate.

The committee to determine the value of secondary school credits will hold regular meetings in order that the classification of new students may not be delayed.

All entrance credits must be on file not later than the second Monday in August or the first Monday in January.

Students entering the Freshman class by certificate from accredited high schools or colleges must present specific certificates showing amount and grade of work done and text-books used in the subjects required for entrance. Such certificate showing the successful completion of the amount of work required in the various subjects for entrance to the College will be accepted and the student admitted to the Freshman class without examination.

Superintendents and Principals are urged to send to the College immediately upon the close of the school year the Uniform Admission Certificate of each graduate intending to enter the College at the beginning of the ensuing College year. If on inspection the certificate is found satisfactory the applicant will be forwarded a certificate entitling him to admission without examination. Uniform Admission Certificates may be had by teachers and students upon application.

Graduates of schools fully accredited by other colleges which have as high a standard of entrance requirements as this institution will also be admitted as Freshmen upon presentation of certificates of graduation, accompanied with Uniform Admission Certificate.

College Credit for Work Done Elsewhere.

Graduate and under-graduate students of other colleges will be admitted and granted such credits as their work will justify. Work of recognized merit that has been taken at other colleges or universities of good rank and standing will be credited for an equivalent amount of work so far as it applies in any of the courses offered in this College. Credits allowed, may at the option of the heads of departments, be conditioned on satisfactory work during the student's first semester in college.

Adult Special Students are admitted in accordance with the provisions found under Special Students. See Index.

Admission by Examination.

Students desiring to enter by examination wil be given such examinations upon any subject required for entrance upon presentation of satisfactory evidence of having devoted sufficient time in the preparation of such subjects.

Examinations for entrance to College will be conducted at the opening of each semester on the Tuesday and Wednesday preceding classification.

Entrance Examination Periods:

Tuesday.

8-10 A. M.—Public Speaking. Room 308, Central Building.
10-12 A. M.—English. Rooms 1 and 3, Central Building.
1-3 P. M.—Language. Room 119, Central Building.
3-5 P. M.—Botany. Room 312, Central Building.

Wednesday.

8-10 A. M.—Mathematics. Room 221, Central Building.
10-12 A. M.—History. Room 208, Central Building.
1-3 P. M.—Civics. Room 102, Central Building.
3-5 P. M.—Language. Room 119, Central Building.

The Freshman work will be of such grade that a graduate of an accredited school can reasonably be expected to be prepared to carry it creditably. All students are urged to review thoroughly at high school or elsewhere Algebra and English Grammar just before entering. Diplomas of graduation will not be accepted for entrance unless accompanied by certificates as stated above.

ENTRANCE REQUIREMENTS.

The requirements for admission are stated in terms of credits. The erm credit means the equivalent of five forty- or fifty-minute recitations er week in a given subject for a term of eighteen weeks, adequate time eing given to the preparation of each lesson.

Students desiring admission to the Freshman year must present irty credits. Of these, certain are required and the balance elective, s stated below under requirements for admission to the several divisions f the College.

A. The following 17 credits are required of all entering the urses in Agriculture, Engineering and Science:

Mathematics,	Credits
Algebra	3
Geometry, plane	2
English	6

History	2
***Foreign Language** German, French, Spanish or Latin	4

B. Electives.

Agriculture, Elements of	1
Astronomy	1
Bookkeeping	1 or 2
Botany	1 or 2
Business Arithmetic	1 or 2
Chemistry	1 or 2
Civics	1 or 2
Commercial Geography	1
Drawing, freehand or perspective	1 or 2
English	1 or 2
Geology	1 or 2
German	2 or 4
Greek	2 or 4
History	2 or 4
Latin	2 or 4
Manual Training	1, 2 or 3
Mathematics	1 or 2
Mechanical Drawing	1, 2 or 3
Mental Arithmetic	1
Optional	2
Physics	2
Physical Geography	1 or 2
Physiology	1 or 2
Political Economy	1 or 2
Spanish	2 or 4
Stenography	1 or 2
Zoology	1 or 2

Limitations. Not more than four elective credits will be accepted in Foreign Language or any other one subject. No Foreign Language course of less than two credits will be accepted from students presenting only one foreign language.

Optional Subjects. An optional subject is any subject of the student's high school course not specified in the list of elective subjects.

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*Students may be admitted without Foreign Language under the following conditions:

1. The student must offer all of the required credits except the four in Foreign Language, together with sufficient elective credits to make a total of thirty.

2. The language requirements must be made up before graduation. It will ordinarily require, if taken in College, extra work to the extent of five hours a week for one year. This extra work will not be credited as part of the credit hours required for graduation in the several courses. Opportunity for making up deficiencies in language will be offered by the College.

REQUIREMENTS FOR ADMISSION TO THE SEVERAL DIVISIONS OF THE COLLEGE.

Division of Agriculture.

Required Credits:

Algebra	3
Geometry, plane	2
English	6
History	2
*German, French, Spanish or Latin	4
Science	1
	18

Elective Credits:

The remainder of the thirty necessary credits must be made up by elections from B. Electives.

Division of Engineering.

Required Credits:

Algebra	3
Geometry, plane	2
Geometry, solid	1
English	6
History	2
*German, French, Spanish or Latin	4
	18

Elective Credits:

The remainder of the necessary credits must be made up by elections taken from B. Electives.

Division of Science.

Required Credits:

Algebra	3
Geometry, plane	2
Science	1
English	6
History	2
*German, French, Spanish or Latin	4
	18

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*See Notes 1 and 2 under Entrance Requirements, page 36.

Elective Credits:

The remainder of the necessary credits must be made up from elections taken from B. Electives.

Division of Veterinary Medicine.

Candidates having a college degree, diploma from an accredited high school or those who have passed successfully the matriculate examination of a recognized college will be admitted without examination.

Graduates from recognized schools of Veterinary Science, Agriculture, Medicine, Dentistry, or Pharmacy will be given credit for the work pertaining to the course, upon the presentation to the faculty of satisfactory standing or upon passing an entrance examination.

General Statement Concerning Entrance Credits.

Students and others desirous of learning something of the amount and kind of work required for entrance to Freshman classes will find suggestive outlines below for some of the most important subjects.

MATHEMATICS.

Following the policy of other institutions, this College accepts three credits in Algebra, two in plane geometry, and, in the Engineering Courses, one of solid geometry as meeting its entrance requirements in mathematics. Experience shows us, however, that those students are best prepared who have taken this work in the preparatory school in order as follows:

(a) Algebra, two credits:

Addition, subtraction, multiplication, division, factoring, highest common factor, lowest common multiple, fractions, simple equations (with one, two and several unknown quantities), followed by problems, theory of exponents, involution, evolution, radicals, inequalities, quadratics (with one or two unknown quantities), and problems involving quadratics.

(b) Plane Geometry, two credits:

The work on this part of the subject is such as is given in any standard text in geometry including a large number of exercises.

(c) Solid Geometry, one credit:

This should cover the same ground as that included in any good text, including originals.

(d) Review Algebra, one credit:

While this subject does not include any topic not named under elementary algebra, a much fuller treatment of these subjects is expected in this work. Principles as well as processes should be learned; theorems and rules should be rigorously demonstrated; the exercises and problems should be more difficult; and students should be drilled in short methods and rapid and accurate work.

This review in algebra should be given in the last year of the high school, when the student has the maturity gained by age and the broader reasoning powers acquired from geometrical training. Such a review immediately before entering college will give the student a broader and more comprehensive knowledge, will make clear to him many things which he did not understand when he first went over them, and will equip him with better and more rapid methods of work. Experience has proven the statement true that "It is not sufficient that a student *should once have known* his preparatory mathematics; he must know them *at the time when he begins his work here.*"

(e) Additional Credits:

Certain schools in the state use three semesters for the work of course (a) and give the review in the senior year in addition. Since this gives the student a much more thorough foundation and is particularly desirable, especially in the engineering courses, an additional elective credit is given when such work is taken.

ENGLISH.

The six credits required in English include the following subjects, and should provide the training indicated below.

1. Composition and Rhetoric, two credits:

The constant aim in this study should be to acquire the habit of clear and correct expression. To secure this result the fundamental principles of rhetoric should be taught not as an end, but as a means to an end—the development of skill; not as definitions to be memorized, but as rules to be applied in actual composition. Accordingly the course should require constant practice in writing, followed by careful revision and correction of mistakes. The topics for themes may be drawn in part from other studies, such as literature and history, but in the main they should rest upon experience and observation, in order that the student may be trained to clear, correct, and effective self-expression. In all his writing he should cultivate habits of correct spelling, sentence-structure, punctuation, and paragraphing. Should his freshman themes prove defective in these respects, the college reserves the right to require him to make up his deficiencies.

2. English and American Literature, three credits:

Reading of Classics. The following books are recommended by the Joint Conference on Uniform Entrance Requirements in English, and the list has been accepted by practically all the colleges in the United States.

1908-1911.

(a) **For Reading,** ten books selected from the following list:

Group I. (Two to be selected.) Shakespeare's *As You Like It, Henry V., Julius Caesar, The Merchant of Venice, Twelfth Night.*

Group II. (One to be selected). Bacon's *Essays,* Bunyan's *The Pilgrim's Progress,* Part 1; *The Sir Roger de Coverly Papers* in the Spectator; Franklin's *Autobiography.*

Group III. (One to be selected). Chaucer's *Prologue;* Spenser's *Faerie Queene,* (selections); Pope's *The Rape of the Lock;* Goldsmith's *The Deserted Village;* Palgrave's *Golden Treasury* (First series) Books II and III, with especial attention to Dryden, Collins, Gray, Cowper and Burns.

Group IV. (Two to be selected). Goldsmith's *The Vicar of Wakefield;* Scott's *Ivanhoe;* Scott's *Quentin Durward;* Hawthorne's *The House of Seven Gables;* Thackeray's *Henry Esmond;* Mrs. Gaskell's *Cranford;* Dickens' *A Tale of Two Cities;* George Eliot's *Silas Marner;* Blackmore's *Lorna Doone.*

Group V. (Two to be selected). Irving's *Sketch Book;* Lamb's *Essays of Elia;* De Quincey's *Joan of Arc* and *The English Mail Coach;* Carlyle's *Heroes and Hero Worship;* Emerson's *Essays* (selected); Ruskin's *Sesame and Lilies.*

Group VI. (Two to be selected). Coleridge's *The Ancient Mariner;* Scott's *The Lady of the Lake;* Byron's *Mazeppa* and *The Prisoner of Chillon;* Palgrave's *Golden Treasury* (First series) Book IV., with especial attention to Wordsworth, Keats, and Shelley; Macaulay's *Lays of Ancient Rome;* Poe's *Poems;* Lowell's *The Vision of Sir Launfal;* Arnold's *Sohrab and Rustum;* Longfellow's *The Courtship of Miles Standish;* Tennyson's *Gareth and Lynette, Lancelot and Elaine,* and *The Passing of Arthur;* Browning's *Cavalier Tunes, The Lost Leader, How they Brought the Good News from Ghent to Aix, Evelyn Hope, Home Thoughts from Abroad, Home Thoughts from the Sea, Incident of the French Camp, The Boy and the Angel, One Word More, Herve Riel, Pheidippides.*

(b) **For study and practice:** Shakespeare's *Macbeth;* Milton's *Lycidas, Comus, L'Allegro,* and *Il Penseroso;* Burke's *Speech on Conciliation with America,* or *Washington's Farewell Address* and Webster's *First Bunker Hill Oration;* Macaulay's *Life of Johnson,* or Carlyle's *Essay on Burns.*

In the study of the books prescribed above the constant aim should be to develop the student's power of appreciation. He should be trained to observe for himself, to analyze for himself, to reach judgments of his own. One excellent method is to give with each assignment specific questions directing attention to certain qualities of thought or plan or style. In this way the student may be trained to observe the fundamental qualities and principles of literary expression. The selecting of appropriate epithets and figures of speech, of beautiful, suggestive, or forcible phrases, of qualities that make style now easy or familiar, now ornate, dignified, or forcible, will develop a sense of literary values, and cultivate the power of literary appreciation. Moreover, by such study the student will insensibly strengthen and enrich his power of self-expression. Having been trained to see and to appreciate clearness, force, and beauty, he will strive to develop these qualities in his own writing, and literature will acquire an added interest through a sense of the power it may confer. In other words the student should come to feel the utility of literature as well as its beauty. The teacher who appreciates that development is the end to be sought, will guard against giving ready-made judgments, which may injure by forstalling investigation. Properly taught, literature calls for observation, analysis, comparison, as truly and as constantly as does botany. The teacher's function is largely to direct this observation. Manuals of literature, however excellent, should be treated as subsidiary. Biographical details may be helpful in stimulating interest, the conditions of the time may supply the setting, but the thing to be *studied* is the book itself.

3. Grammar, one credit.

In the last year of the high school course there should be a thorough review of grammar, extending through one semester. Prior to this time in the course the student is not mature enough to master the more difficult relations of the sentence, or to appreciate how necessary a clear knowledge of sentence structure is to real progress in composition. If the student does not understand the structure of the sentence, he cannot reasonably be expected to frame sentences that are correct in structure or to learn to construct better sentences; thus his ignorance of grammatical relations prevents real progress in composition.

The percentage of failures in the first course in college composition would be materially reduced if grammar were more thoroughly reviewed in the last year of the high school course. From this review the student should be helped in the following ways:

a. He should be trained to analyze good modern prose, sentence by sentence, from such authors as Addison, Macaulay, Hawthorne, and Stevenson. He should be trained to observe clearness, emphasis, unity, climax, variety, and other qualities in sentence structure, and to note the effect of different types of sentence—short, long, balanced, loose, and periodic.

b. He should also be trained to construct sentences of all types. One very helpful method is for the teacher to give out in analyzed form well-constructed sentences of the various types, and require the student to arrange these elements in the best order for clearness, emphasis, balance, climax, etc. Most students find this constructive work more interesting than the analytical, and also more helpful.

c. He should also be trained to analyze the sentences of his own essays, to note sameness or variety in sentence length and form, also clearness, emphasis, balance, and other qualities essential to effective expression. It is not assumed that his high school course in English will make him a master sentence-builder, but it should give him sufficient knowledge and practice to make his every sentence clear and correct, and it should start him on the road to mastery of sentence construction.

4. Elective Credits in English.

Students who present the required credits set forth above, may also receive two elective credits for additional work. Such credits will be granted for more extended study of English or American Classics, or for the study of a good History of Literature, supplemented by study of some of the minor authors not previously studied, or by more minute or more extended study of the major authors.

HISTORY.

It is recommended that emphasis be put on history in the High Schools along the line suggested by the Report on History in Schools by the Committee of Seven of the American Historical Association, and that not less than two years be given to the subject. The following would be a suggestive course: One year in Greek and Roman History; one semester in English History, or Modern History with special emphasis on English History; one semester on American History. If a three years course be given then devote a year to each of the above. If a four years course be given the following course would be suggested: One year each to the following subjects: Greek and Roman History, to 800 A. D., Mediaeval and Modern from 800 A. D., English History, American History.

In all the above there should be the use of the best modern texts and outside reading with notes, and some instruction in historical geography.

The American History given in the Academic year at the State College is what is usually given in the fourth year of the High School after the pupil has had European or English History in the preceding years. It is recommended that students contemplating entering this College take Advanced American History in the fourth year of the High School. The sample questions will indicate the general scope of the work.

MODERN LANGUAGES.

In the case of each of the three modern languages which may be offered for admission, a course of study is suggested. What the College demands is proficiency in the subject rather than a particular course of study, and the courses are outlined simply to indicate how the necessary proficiency may be attained.

German. During the first year the work in German should comprise: "German Lesson Grammar," Joynes and Wesselhoeft. The reading of from seventy-five to one hundred pages of graduated texts. The student should be taught to read with ease such texts as Storm's "Immensee."

(1) The principles of German Grammar should be thoroughly mastered; (2) There should be abundant exercise in composition, reading and conversation; (3) Careful drill upon pronunciation; (4) The memorizing and frequent repetition of easy colloquial sentences; (5) drill upon the inflections of the articles, of such nouns as belong to the language of everyday life, of adjectives, pronouns, weak verbs and the usual strong verbs, the use of the common prepositions, the modal auxiliaries, the passive voice, and the subjunctive mood, and the elementary rules of syntax and word order.

During the second year the work should comprise: (1) the reading of good literature in the form of stories and plays—as "Hoher als die Kirchie," Hillern, "Willkommen in Deutschland," Mosher, and "Wilhelm Tell," Schiller; (2) accompanying practice in the translation into German of variations upon the matter read; (3) continued drill upon the rudiments of the grammar.

French. During the first year the work in French should comprise: (1) a thorough knowledge of grammar principles, as given in Fraser and Squair's French Grammar; (2) careful drill in correct pronunciation; (3) composition, conversation and dictation, based upon French Prose Composition by Francois; (4) through course in irregular verbs; (5) "Sans Famille," Malot.

During the second year the work should comprise: (1) "Mon Oncle et Mon Cure," La Brete, "La Chute," Hugo, Tales of Manpassant and Zola, "Le Chevalier de Maison Rouge," Dumas; (2) prose composition, conversation and dictation.

Spanish. During the first year the work in Spanish should comprise: (1) "First Spanish Book and Reader," Giese; (2) "Metodo Berlitz," with frequent exercises in composition, conversation and dictation.

During the second year the work should comprise: (1) Review of grammar with exercises; (2) "El Capitan Veneno," "Dona Perfecta," Galledos Alarcon. (3) Constant reading of the Spanish is required with careful drill in correct pronunciation.

BOTANY.

The student should master the principles of the general morphology of flowering plants and the terms commonly used in descriptive botany, as well as the determination of our common flowering plants. The high school should offer laboratory work along with Leavitt's Lessons, or Bergen & Davis' "Principles of Botany," or Coulter's "Text-Book of Botany," or any other work covering the same general ground.

SUGGESTIVE LIST OF EXAMINATION QUESTIONS.

For Entrance by Examination into the Freshman Year.

ALGEBRA.

1. From $5xy-(m-n)\ (k+1)-(a+b)\ (d+c)$ subtract $(d+c)\ (a-b)+5\ (k+1)-acy-mny$.

2. Remove the parentheses and simplify.

$$7x^2\left\{\frac{a+b}{c-d}-y-4-(n-m)\right\}-\left\{\frac{2(y+4)}{3}-71x^2-\frac{a+b}{c-d}-\overline{m-8+n}\right\}+8$$

State the rule by which parentheses preceded by the plus or minus sign are removed.

3. Divide $-45a^{1-x}b^{-2}c^x(m+n)^6+ab^xc^{1+x}\ (m^2+2mn+n^2)^3$ by $3a^6b^2c^x\ (m+n)^3$.

4. Write the product of $(3x-2)\ (3x+5)$, of $(2x+2)\ (2x+2)$, and also of $(3y+1)\ (3y-1)$ and give the special rules of multiplication used.

5. Resolve $a^{12}-a^8b^4-a^4b^8+b^{12}$ into its prime factors.

6. Fine the lowest common multiple of

$$2x^4+3x^3+3x-2 \text{ and } 3x^4+5x^3+x^2+5x-2.$$

7. Simplify

$$\frac{a^2-b}{(a-b)\ (a-1)}+\frac{b^2+a}{(b+1)\ (b-a)}+\frac{1+ab}{(1-a)\ (1+b)}$$

What is the effect on a fraction of changing:

(a) Any two of the three following signs: signs of numerator, sign of denominator, or apparent sign of the fraction.

(b) The signs of an odd number of factors in the numerator.

(c) The signs of an even number of factors in the numerator.

8. Solve the following equation:

$$\frac{x-\dfrac{3(x-5)}{4}}{8}-\frac{x-3}{4}=x+1-\frac{8x-\dfrac{2(x+16)}{17}}{6}$$

9. A man rowing at a certain rate makes the round trip from A up stream to B, 24 miles distant, and return, in 5 hours. Having six hours at his disposal, he starts to make the trip, but when 16 miles from A, the boat springs a leak which causes him to land. In so doing he loses 40 minutes, but by walking at three-fourths the speed the boat would have carried him, he is able to spend an hour in B, and reach home in the required time by a train moving at twice the speed which the boat would have moved down stream. What is the rate in miles per hour of the man rowing in still water and what is the rate of the current?

10. **Find the values of a and b in the following:**

$$\frac{3}{2a}-\frac{4b}{b-2a+3}=2\tfrac{1}{2}$$
$$\frac{1}{a}+\frac{1}{b-2a+3}=-\tfrac{1}{6}$$

11. **Find the value of $(-5a-yb^{k}+{}^{1}c^{8})^{-5}$ freeing the result of negative exponents.**

12. Find the cube root of:

$8a^{\frac{3}{2}}-12a^{\frac{1}{2}}+42a^{-\frac{1}{2}}-\frac{1}{2}-37a^{-\frac{3}{2}}+63a^{-\frac{5}{2}}-27a^{-\frac{7}{2}}+27a^{-\frac{9}{2}}$.

13. Find the sum of $\sqrt[3]{54x^{a-3}y^{6}}$, $\sqrt[3]{16x^{a+6}y^{3}}$ and $\sqrt[3]{2x^{4a+9}}$.

14. Multiply $\sqrt[2n]{x^{3}}$ by $\sqrt[n]{x}$ by $\sqrt[3n]{x^{2}}$

15. Find the cubic root of $\frac{3}{5}\sqrt{\frac{3}{5}}$

16. Multiply $\sqrt{2}-3\sqrt{-5}$ by $\sqrt{5}+\sqrt{-3}$

17. Find the square root of the binominal surd $67+7\sqrt{72}$

18. Solve $\sqrt{x^{2}-6x}-5\sqrt[4]{x^{2}-6x}+6=0$

19. Solve $9x^{2}-5xy=21$ and $xy-y^{2}=-4$, solving for x and y.

20. Two trains starting at the same time and going in opposite directions between M and N, upon meeting, have differed in the distance covered by 20 miles. It is found that the train from M will reach N in one and one-half hours from the time of meeting and the train from N will reach M in 40 minutes. How far apart are M and N, and what is the rate of each train?

ENGLISH.

The examinations in English will include questions in grammar and elementary rhetoric and also one or more essays, to test the student's readiness and accuracy of expression. The following list of questions indicates the general nature of the examination:

I. In the following sentence, (a) state the exact grammatical relationship of each phrase and clause; (b) parse the words in black; (c) account for punctuation. "**What** if their palaces were grand, and their villas **beautiful** and **their** dresses magnificent, and their furniture costly, **if** their lives **were spent** in ignoble and enervating pleasures, **as** is **generally** admitted?"

II. In the following sentences name the part of speech and state the office of the words in black:

(a) I believe **him to be unprejudiced.**

(b) **Alice,** did you go **boating yesterday?**

(c) It cost **me** a **struggle** to **give** up the trip.

(d) They let **him stay.**

(e) "Ask **yourself** seriously **whether** you are **fit to read such** revelations **as** are **to follow.**"

III. Discuss **fully** and **carefully** four of the following topics:

(a) The topic sentence and its development.

(b) The respective advantages of the long sentence, the periodic sentence, the balanced sentence.

(c) Unity in the paragraph.

(d) Coherence in the composition.

(e) Emphasis in the sentence.

IV. Write an essay of from 250 to 350 words on one of the following topics:

(a) A Reminiscence of My Childhood.

(b) Why I like ———. (a book, an eminent man, a place.)

(c) Describe a view from ———.

(d) All Students Should be Required to Take Athletics.

NOTE.—These essays are considered an important part of the examination. They will be graded mainly in diction, sentence structure and connection, and paragraphing. Good penmanship, neatness of manuscript, and correct spelling and punctuation are also important.

V. The examination in Literature will consist of two parts: first, over some of the books prescribed "For Reading;" and second, over some of those prescribed "For Study and Practice." (See pp. 40 and 41.)

The first part of this examination is designed as a test of the student's appreciation of the book as a whole, or of some prominent incident, character, or quality; also as a test of his ability to express himself in accordance with the fundamental principles of discourse. Effective training for such an examination would be provided by writing concise paragraphs or well arranged essays on topics such as are suggested above.

The second part of the examination will call for evidence of more thorough and systematic study. It may call for concise answers concerning allusions, figures of speech, qualities of style, and the interpretation of certain passages. It may also call for analysis or comparison or grouping of characters; also for plot, development in the work as a whole, or in some prominent part.

In both parts, knowledge of details, of minutiae of any sort, will be considered much less important than the ability to express thoughts, clearly, correctly, and in good order. In like manner the mere memory of details, of literary history or of opinions of critics, signifies much less than a genuine, independent appreciation of literature, the power to enter into the merit of a book.

The following questions on *The Tale of Two Cities* suggests the sort of topics that may be anticipated on the books prescribed "For Reading:"

1. Are the titles of the "books" into which the story is divided, good ones? (1. Recalled to Life; 2. The Golden Thread; 3. The Track of a Storm.) Tell why. Discuss one title fully, the others briefly.

2. Write a character of one of the chief characters. (Not long, necessarily, but complete.)

3. Write a careful description of what you consider the greatest scene.

The following questions on *Macbeth* suggest what may be anticipated on the books prescribed "For Study and Practice."

1. Explain the structure of the play, giving the initial incident, the climax, and the catastrophe.

2. Explain the function of the first scene.

3. State briefly by whom and under what circumstances the following lines were spoken:

a. "Had I but died an hour before this chance,
I had lived a blessed time."
b. "All the perfumes of Arabia will not sweeten this little hand."
c. "Thy bones are marrowless, thy blood is cold;
Thou hast no speculation in those eyes
Which thou dost glare with."

4. What makes the sleep-walking scene so effective?

5. Explain the meaning of this passage, carefully, step by step:

"If it were done when 'tis done, then 'twere well
It were done quickly; if the assassination could
Trammel up the consequence; that but this blow
Might be the be-all and the end-all here,
But here on this shoal and bank of time,
We'd jump the life to come."

6. Compare Macbeth and Banquo.

HISTORY.

EUROPEAN HISTORY.

1. Discuss (a) the significance of the Nile in the history of Egypt, and (b) the arts and industries of ancient Egypt, (c) Outline the work of a famous Egyptian king.

2. Give the date, important facts, and results of the Persian invasion of Greece in the reign of Darius.

3. The Athenian Empire: (a) trace its origin; (b) when was it at its height? (c) state the effect of the Peloponnesian war upon it.

4. Discuss the influence of the geographical features of Italy upon Roman history. Name the races of people in Italy at the dawn of the Italian history.

5. Outline the chief features of the Roman constitution in the reign of Augustus.

6. Feudalism: (a) its origin; (b) classes in feudal society; (c) feudal rights and obligations; (d) value of feudalism.

7. Give date, causes, and results of the Crusades.

8. Discuss the rise and growth of the Italian city republics.

9. Magna Charta: (a) circumstances under which it was secured; (b) chief provisions.

10. Reformation in Germany: (a) leading men; (b) principal steps in the movement.

11. Discuss fully the causes of the French revolution.

12. Something of importance concerning each of the following: Cardinal Wolsey, William the Silent, Cardinal Richelieu, Gustavus Adolphus, Charles Martel, Peter the Great, Oliver Cromwell, Lord Nelson, Bismarck.

AMERICAN HISTORY.

1. Sketch a map of the United States, indicating (a) the boundaries at the close of the Revolutionary War, and (b) each tract of land secured by treaty or purchase since the Revolution.

2. When and by whom was each of the following colonies first settled? New York, Virginia, Georgia, and Pennsylvania.

3. Tell something of importance concerning each of the following: Patrick Henry, William Loyd Garrison, Robert Fulton, William Penn, Robert Morris.

4. The United State Constitution: (a) By whom framed? (b) Why was such a new constitution needed? (c) When adopted? (d) What were some of most striking differences between it and the articles of Confederation? (e) When and in what respects has the Constitution been amended?

5. Enumerate the most important political parties which have arisen in the United States? State circumstances of the rise of each.

6. What were the most important facts concerning Jefferson's administration?

7. War of 1812: (a) Causes; (b) Important leaders; (c) Results and significance.

8. Discuss the relation of Henry Clay to the Slavery Struggle.

9. The Southern Confederacy: (a) When established? (b) Its president? (c) Why established? (d) How long did it last? (e) What states were included in it?

10. Write an essay of not more than 300 words on the American Indian.

ACADEMIC CLASSES.

For the accommodation of graduates from the smaller high schools of the state which offer only three years of work, and for other students who have had equivalent preparation elsewhere, this institution offers instruction in Academic classes in certain of the studies mentioned under (A) required credits, and also in certain elective credits. These subjects are here listed with a statement of the registered number of the course, the hours, and the semester in which the same are offered:

COURSE	NAME OF SUBJECT	HOURS CREDIT	SEMESTER TAUGHT	LEADING TO COURSE IN
Botany 1	Elementary Botany	2	First	Agricultural
Civics 1	Government in State and Nation	2	First	Civil Engineering and Science
Civil Engineering 2	Field Work	1	First	Civil Engineering
Civil Engineering 1	Lettering	1	Second	Civil Engineering
English 1	Grammar	5	First and Second	For Academic Admission
English 2	Rhetoric and Composition	5	First and Second	All Four Year Courses
History 1	English History	5	First	For Academic Admission
History 2	Advanced American	4	First and Second	Science
History 16	National Period	3	First and Second	Agricultural and Engineering
Language 1	French	5	First	All Four Year Courses
Language 2	French	5	Second	All Four Year Courses
Language 5	German	5	First	All Four Year Courses
Language 6	German	5	Second	All Four Year Courses
Language 30	Spanish	5	First	All Four Year Courses
Language 31	Spanish	5	Second	All Four Year Courses
Literature 12	English Classics	4	Second	Agricultural and Engineering
Mathematics 1.	Algebra	5	First and Second	For Academic Admission
Mathematics 2.	Algebra	5	First	All Four Year Courses
Mathematics 3.	Algebra Review	5	First and Second	All Four Year Courses
Mathematics 5.	Plane Geometry	5	Second	All Four Year Courses
Mathematics 6.	Solid Geometry	3	Second	Engineering
Mechanical Engineering 19	Freehand Drawing	1	First	Mechanical Engineering Electrical Engineering
Mechanical Engineering 29	Manual Training	1	Second	Mechanical Enginerring Electrical Engineering
Mining Engineering 20	Elements of Mining	1	First	Mining Engineering
Mining Engineering 21	Elements of Mining	1	Second	Mining Engineering
Public Speaking 2	Declamation	2	First and Second	Agricultural

The Chairman of the Entrance Requirement Committee and the College Registrar shall have authority to determine the value of preparatory credits submitted, and notify applicants of assignment in course. Such assignments will be conditioned on the students doing creditable work.

Any student who at entrance presents satisfactory credit for part of the Academic course, or who by examination passes part of it satisfactorily, will be classified in such of the remaining work offered in the Academic year as the Dean of the Junior College and the Dean of the Division in which the student is enrolled shall consider will best prepare him for his college course. After providing in such classification for the remainder of the 30 credits required for entrance to college, the student may complete his schedule by taking up some of the Freshman studies.

Completion of the Academic work will not entitle the student to enter the Freshman class unless he presents the 30 semester credits regularly required for entrance, as already stated, not more than 7½ such credits being allowed for any year of the work of a secondary school. Inasmuch as the high school period is from forty-five to fifty minutes and the college period sixty minutes, the Academic course will be counted as 7½ credits.

Opportunity will be offered during the four weeks winter vacation whereby students deficient in Mathematics, English, or Modern Language, can take up some work in these lines under private tutors.

ENTERING IN JANUARY.

Students may enter the State College in the academic course, at the opening of the second semester, in January as advantageously as in the fall. Many students find it desirable to begin their studies in College in the second semester. Those who have had no considerable algebra in the preparatory school should review its fundamental principles and become acquainted with its application in the wider and more difficult field of college work, and those who have had experience in plane geometry can, to advantage, supplement such study by a review of some standard text and a thorough drill in original geometric propositions. The classes established at the beginning of the spring semester furnish an excellent opportunity for students to prepare themselves thoroughly for entering upon collegiate work at the opening of the next college year.

SPECIAL STUDENTS.

Students taking special work in any of the college courses must be at least twenty years of age, must give good and satisfactory reasons for desiring such classification and must furnish satisfactory evidence that they are thoroughly prepared to pursue the work chosen. Permission to take such special course and the subjects included therein must receive the approval of the President of the College and the Dean or Head of the Department in which the student seeks enrollment.

(1) Permission to take special course will not be granted to students until they have completed the freshman year of some one of the courses offered, and then not to exceed a period of two years, except on the recommendation of the Faculty of the division in which the student is enrolled and on approval of the President of the College.

(2) All special students shall pay additional fees for special work of ten dollars for each semester.

Special and Short Course students are subject to the same rules governing conditions on back work that apply to all other students. Students wishing to change from a regular to a special or short course either in the same or another department will be required to remove all conditions on back work. Special students, as well as regular students, are subject to the conditions given under "Entrance."

It is the theory of special classification that students should be particularly strong and well prepared to do thorough work in the studies they elect. A high standard of scholarship will, therefore, be required of all who are thus classified.

SHORT COURSE STUDENTS.

Worthy students of good standing, over twenty years of age, not prepared to meet the entrance requirements of the Freshman year, may be admitted as short course students not exceeding two years without examination, provided they give evidence of satisfactory preparation to carry such work successfully.

Short Course students who have not had previous work of collegiate grade will be required to take the first year of their work from Junior College studies.* During the second year they may be admitted to the Senior College studies in accordance with the rules governing admission to each study or course.**

FEES AND EXPENSES.

The entire expenses of a student need not exceed $300.00 per College year.

Tuition.—No charge for tuition is made to the students from the state of Iowa. To the non-residents, a tuition fee of $50.00 per year is charged.

Janitor Fee.—The regular janitor and incidental fee for the semester is $10.00, but all students who classify during the classification period, Thursday, Friday, and Saturday before College work begins, will be charged a janitor fee of only $8.00 per semester.

Laboratory Fees.—Laboratory fees at the actual cost of breakage and usage are charged to the students, the Treasurer's receipt for such fee being required before the students are admitted to laboratories. For the amount of such fees see department descriptive courses.

Board and Room.—About one hundred young women can secure rooms in Margaret Hall. The privilege of rooming in this building is reserved for regular students. Students rooming in this building furnish their own bedding and all furniture except bedsteads, dressers, and tables. Each girl pays $9.00 per semester for room and a sum not exceedingly 55 cents per week for lighting, heating and incidentals.

All other students can secure furnished rooms and board in clubs or private families adjacent to the College grounds at from $3.50 to $4.50 per week.

The College Custodian, office in old office building, should be consulted by all new students concerning rooms and rooming places, that undesirable rooms and houses may be avoided. The College authorities reserve the right to forbid students rooming in any particular house for sanitary or any other reasons.

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*Special Interpretation for Agricultural Students.—An exception to this rule will be made in case of Animal Husbandry 11 and 12, which may be taken the first year in lieu of Animal Husbandry 2 and 3, which cannot be taken until the work in Animal Husbandry 1 and 2 has been completed.

**For conditions of admission to any course, see the description of the course of study.

No group of young women students may establish a "house" or "home" without the full knowledge and approval of the President and the Dean of Women, nor make any definite plans in such direction. No young woman may become a resident of a sorority house until after she is an initiated member of the sorority.

The young women residents of Margaret Hall are required to board in one of the Margaret Hall boarding clubs.

Hospital Fee.—All students living in College buildings, and such others as desire to, pay a Hospital fee of $2.50 per semester. (See College Hospital).

Diploma Fee.—A diploma fee of $5.00 is payable before graduation.

Text Books.—All text books and stationery may be purchased at the College Book Store at about twenty per cent below the average retail price.

As security for the payment of bills, all students living in College buildings are required to deposit $10.00 with the Treasurer, which deposit will be returned at the final settlement at the close of the semester. All the bills for each month must be settled at the Treasurer's office by the second Saturday of the next month.

ENTRANCE.

The office will be open for registration at 8:00 A. M. on the Thursday preceding the opening of each semester. All students are required to register as soon as possible.

Students who are required to take the entrance examination will be examined here the Tuesday and Wednesday preceding classification days.

After passing the examinations, the examination card should be taken to the classifying committee who give a card of classification which admits to college and assigns to class work. The student's name is at once entered upon the official list, and will be included in the roll call of the following day. Attendance is expected thereafter at every recitation of the semester.

CLASSIFICATION AND STANDINGS.

Junior and Senior College.—The students are now classified in "Junior and Senior Colleges." The Junior College is composed of all students in the Academic, Freshman and Sophomore years: the Senior College, of all in the Junior and Senior years.

Amount of Work.—The amount of work in each course is expressed in hours, *an hour* meaning one recitation or its equivalent per week throughout the semester. It is considered that one hour's recitation or lecture will require as much time in the preparation, and hence is equivalent and receives an equal credit with a three hour laboratory.

Number of Hours.—No student shall be allowed to classify in more hours than are specified in the catalogue for the semester of the course taken unless he has an exceptionally high record in his previous college work. The taking of such additional work is subject to the approval by the Dean under whom the student is classified and the Head of the Departments in which the student is classified.

In general, students failing in any portion of a term's work will not be allowed to take full classification for the next semester.

Classification.—No student shall be admitted to or dropped from any class except by authority of the Classifying Officer.

Conflicts.—Students shall not classify in conflicting studies without the approval of the Classifying Officer and Heads of the Departments in which the student wishes to enroll.

Standing.—All the standings are based on the scale of 100. The passing grade is 75. A student receiving between 60 and 74 per cent inclusive in any course is conditioned and allowed to make up the condition under the direction of the head of the department. A student receiving below 60 per cent in any course is not passed in that course.

Back Studies.—Students shall be classified in back studies in all cases in which such studies are taught, subject to the first rule under Number of Hours. Any exception to this rule must be for good and sufficient reason, approved by the President of the College and the Dean or Head of the Department in which the student is enrolled.

No student shall be considered a candidate for graduation who has not at the beginning of the second semester of the Senior year completed his work to within the maximum number of hours regularly allowed in his course for that semester. If the uncompleted work is not offered in the second semester it shall be passed and reported to the recorder not later than April 1st.

EXAMINATIONS.

Examinations for back work for matriculated students will be conducted at the opening of each semester, on the Tuesday and Wednesday preceding classification days.

TUESDAY.

8-10 A. M.—Farm Crops	Farm Crops Lecture Room, Ag. Hall
8-10 A. M.—Mining Engineering	Room 306, Engineering Hall
8-10 A. M.—Zoology	Zoological Lecture Room
10-12 A. M.—English	Rooms 1 and 3, Central Building
10-12 A. M.—Civil Engineering	Room 312, Engineering Hall
1- 3 P. M.—Mech. Engineering	Rooms 204 and 205, Eng. Hall
2- 4 P. M.—History	Room 208, Central Building
3- 5 P. M.—Public Speaking	Room 308, Central Building
3- 5 P. M.—Electrical Engineering	Room 207, Eng. Hall

WEDNESDAY.

8-10 A. M.—Horticulture	Hort. Lecture Room, Ag. Hall
8-10 A. M.—Chemistry	Room 29, Chemical Hall
8-10 A. M.—Mathematics	Room 221, Central Building
8-10 A. M.—Animal Husbandry	An. H. Lecture Room, Agr. Hall.
10-12 A. M.—Economics	Room 222, Central Building
10-12 A. M.—Dairying	Dairy Building
10-12 A. M.—Botany	Room 312, Central Building
1- 3 P. M.—Civics	Room 102, Central Building
1- 3 P. M.—Mech. Engineering	Rooms 204 and 205, Eng. Hall
1- 3 P. M.—Domestic Economy	History of Art Room
2- 4 P. M.—Modern Language	Room 119, Central Building
2- 4 P. M.—Agricultural Eng.	Agr. Eng. Lecture Room, Agr. Hall
3- 5 P. M.—Soils	Soils Lecture Room, Agr. Hall
3- 5 P. M.—Physics	Room 207, Eng. Hall

DEPARTMENTS MAINTAINED.

Agricultural Chemistry,
Agricultural Engineering,
Agronomy,
Animal Husbandry,
Botany and General Bacteriology,
Chemistry, General and Applied,
Civics,
Civil Engineering,
Dairying,
Domestic Economy,
Economic Science,
Electrical Engineering,
English,
Farm Crops,
Forestry,
Geology,
History,
Horticulture,
Literature and Rhetoric,
Mathematics,
Mechanical Engineering,
Military Science,
Mining Engineering,
Music,
Modern Languages,
Physics,
Psychology and Ethics,
Public Speaking,
Science and Agriculture,
Soils,
Veterinary Science,
Zoology.

GOVERNMENT.

The relations of our College buildings, and the nature of the exercises, complicated as they are, by laboratory work, shop practice and labor, make order, punctuality and systematic effort indispensible. The institution, therefore, offers no inducement to the idler or the self-indulgent. All who are too independent to submit to needful authority, too reckless to accept wholesome restraint or too careless to take advantage of their opportunities, are not advised to come. The discipline of the College is confined mainly to sending away those who prove, on fair trial, to be of this class.

MANUAL LABOR.

The following regulations in regard to manual labor have been adopted by the Board of Trustees:

1. The manual labor of students is divided into two kinds, viz.: Uninstructive labor, which shall be paid for in money, and instructive labor, which shall be compensated by the instruction given and the skill acquired.

2. Uninstructive labor shall comprise all the operations in the workshop, the garden, upon the farm and elsewhere, in which the work done accrues to the benefit of the College, and not to that of the student. Instructive labor shall embrace all those operations in the workshop, museum, laboratories, veterinary hospital, experimental kitchen, upon the farm, garden and experimental stations, in which the sole purpose is the acquisition of knowledge and skill.

3. Students shall engage in instructive labor in the presence and under the instruction of the professor in charge, according to the statement made in each of the courses of study.

The compensated labor furnished by the Divisions of Agriculture, Veterinary Medicine and of Engineering, is given by each to its own students and is eagerly sought. The "details" of compensated labor supplied by the needs of the various departments are given to the most faithful and meritorious students in each department. Uninstructive labor is paid for according to its value to the College, but no student should expect to pay the main part of his expenses by labor while here. The College cannot furnish the work, and even if it could, the student's time is *chiefly needed for study*. Still, many worthy and industrious students pay a considerable part of their expenses by labor, over $4,000 being paid out by the College thus each year to students and post-graduate assistants.

GRADUATING THESIS.

All candidates for graduation in the Engineering and Agricultural courses are expected to present a satisfactory thesis.

The subjects for theses shall be selected under the direction of the professor in whose department they are written, and submitted to the Thesis Committee, with signed approval of the professor, on or before the first Monday in October.

It is expected that each thesis shall represent an amount of work equivalent to at least one exercise per week through the Senior year; that it shall show the result of the student's personal study or investigation and be throughout original in matter and treatment so far as the nature of the subject will permit; that it shall be prepared under the supervision of the professor in charge, the student making frequent reports of progress and having an outline of matter ready for approval by the first week of the last semester.

The complete thesis shall be submitted to the Thesis Committee on or before May 25th.

POST GRADUATE COURSES.

The faculty of this College offers the degree of Master of Scientific Agriculture (M. S. A.) to Bachelors of Scientific Agriculture who are graduates of this College or others offering equivalent courses of study, the degree of Master of Science (M. S.) to Bachelors of Science who are graduates of this College or other colleges offering equivalent courses of study, the degree of Master of Agricultural Engineering (M. A. E.) to Bachelors of Agricultural Engineering who are graduates of this college or other colleges offering equivalent courses of study, and also Professional degrees in Engineering.

MASTER'S DEGREE.

The opportunity for resident study after graduation is a privilege granted only upon the recommendation of the President with the advice and consent of the Committee on Post-Graduate Study and the professors in charge of the departments in which the studies are to be pursued.

The candidate shall spend at least one academic year in residence. If only one year is spent in residence, the candidate shall devote his entire time to his post-graduate studies, except in cases where work previously done *in absentia* is accepted at the beginning of the students' residence by the Professor in charge of the major subject; such *in absentia* work shall constitute not more than one-half of the required work. In the case of graduates of this college, temporary leave of absence may be granted during the year's residence for special study elsewhere. In order to be entitled to his degree, the candidate must meet within four years the requirements existing at the time of matriculation, otherwise he must complete any additional requirements which may be in force at the time of his final examination.

Two lines of work shall be selected, designated as major and minor studies, the former to be given two-thirds and the latter one-third of the time. The major study shall be research work, the results of which shall be incorporated in a thesis.

The major and minor studies shall be so selected as to support and strengthen each other.

No under-graduate study shall be selected as a major study. Under-graduate studies may be taken for part of the minor work only with the approval of the Committee on Post-Graduate Study, and the heads of the departments in which the work is to be done.

The candidate shall have a reading knowledge of French or German.

Application for graduate study, specifying the departments in which the major and minor subjects are to be taken, shall be filed with the President within four weeks of the beginning of the first term's resident work, which, in all cases, shall be not later than October 1st, next preceding the commencement at which the degree is to be granted.

A detailed outline of the work to be done in the major and minor subjects approved by the heads of the departments in which the work is to be taken shall be filed with the Committee on Post-Graduate Study, within eight weeks of the opening of the semester in which resident work is begun.

The candidate for the master's degree shall apply in writing for examinations not later than May 1st, and such examinations shall be given not later than May 15th.

Graduates of other institutions desiring to become candidates for post-graduate degrees in this institution shall be required to show to the Committee on Post-Graduate Study evidence of under-graduate work equivalent to the corresponding course in this institution, and if any deficiency appears in the subjects elected for post-graduate work, to make up such deficiency.

Candidates for advanced degrees are expected to appear on the Commencement stage to receive such degrees.

PROFESSIONAL DEGREES IN ENGINEERING.

The several departments of the Division of Engineering confer the following professional degrees: In Mechanical Engineering, the degree of Mechanical Engineer, (M. E.); in Civil Engineering, the degree of Civil Engineer, (C. E.); In Electrical Engineering, the degree of Electrical Engineer, (E. E.); In Mining Engineering, the degree of Mining Engineer, (E. M.).

Applications for professional engineering degrees will be received from graduates of the engineering departments of this College or from other colleges offering equivalent courses of study in engineering.

A graduate of any of the four year engineering courses, to be entitled to the professional degree, shall have devoted not less than one year to resident study along lines satisfactory to the engineering faculty, shall have been engaged for not less than one year in a responsible professional position, and shall present a satisfactory thesis, or he shall have been engaged for not less than five years in a responsible professional position and shall present a satisfactory thesis.

A graduate of any of the five year engineering courses shall have devoted not less than one year to successful professional work and shall present a satisfactory thesis.

In this connection a responsible professional position means practical engineering experience, requiring the exercise of skill or executive ability in designing or construction work. References or personal knowledge of the facts will be required by the engineering faculty.

Further information as to the lines of work open to graduate students can be found under the courses of study described elsewhere.

COLLEGE HOSPITAL.

The actual sanitary condition of the College is excellent. The buildings are situated on high ground with good natural drainage. The water supply is exceptionally pure and abundant. The sewer system and sewerage disposal plant are the best that modern sanitary engineering can devise. Nevertheless in this, as in other like institutions, whose students are drawn from a wide territory, various diseases are brought here by the students themselves. In order to control epidemics and properly care for other cases of illness or injury, two hospitals are provided. These hospitals are under the charge of the College Physician, assisted by a professional nurse, a competent house-keeper, and a student hospital steward.

The expenses of the hospitals are defrayed from a fund accruing from the hospital fees paid by students.

A hospital fee of $2.50 per semester is required of all students living in College buildings.

The privileges of the hospitals are also extended to students not rooming in the College buildings, provided, 1st, that the physician shall be paid for calls at their residences, and 2nd, that the usual hospital fee shall be paid within the first ten days of the student's arrival.

Students not making the hospital deposit will be admitted to the hospital upon the basis of $10.00 per week, within the discretion of the college physician.

The hospital fee insures to the payer thereof, medical attendance, nursing and medicine in illness or accident, and consultation and medicine for minor ailments in accordance with the regulations herein published.

The charges named are based upon the probable actual cost of medical attendance and hospital service, and the fund created is carefully devoted to these purposes. The College can not assume any liability beyond the extent of the fund so created. The hospital has proved to be a great blessing to the students.

The following regulations apply to the privileges of the hospital:

1st. Students entering the hospital shall be charged $3.00 per week for board, room, light and heat. But for any time in excess of three consecutive weeks per term spent in the hospital an additional charge above that mentioned shall be made of $4.00 per week.

2nd. In case a special nurse or physician is employed, the expense shall be borne by the particular patient, the selection of such nurse or physician to be approved by the College physician.

3rd. The College assumes no responsibility whatever nor shall the privileges of the hospital be extended to cases of smallpox.

4th. The President and College physician may require of students entering the college a certificate of a reputable physician showing successful vaccination.

5th. The College physician is authorized to exclude from the College dormitories and recitation rooms any person afflicted with a contagious disease.

COLLEGE LIBRARY.

The College Library, consisting of over 25,000 volumes and about 8,000 pamphlets, is chiefly a library of reference, containing standard and technical works bearing particularly upon the lines of study pursued in the College. Magazines, periodical literature bearing upon the special work of the students, and daily papers are furnished for the use of the students. The reading room of the library is open thirteen hours daily except Sunday, when it is open four hours. Personal assistance will be given by the librarian and assistant to any who desire help in reference work.

This year the College received by bequest about 1500 volumes pertaining to Engineering and Economics from the library of the late Geo. W. Catt. This Engineering Library with that section of books from the general collection has been made a Departmental Library located in Engineering Hall.

RELIGIOUS LIFE AT THE COLLEGE.

Although a state school, and hence non-sectarian, the College life is dominated by religious influences.

The Young Men's and Young Women's Christian Associations, Bible Study Classes, and Mission Classes, consisting of members from both faculty and student body have a helpful influence not only upon the religious but upon the social life of the College. The members of the Associations assist in the reception of the new students and in the maintenance of religious work.

The work of each Association is under the direction of a general secretary. These two Associations are now located in their new home, "Alumni Hall," which was constructed at an expense of $60,000.00 by funds donated by the Alumni, students, instructors, citizens and friends,. This home is the center of the religious and social life of the College and as a building for such purposes it is not excelled in the West.

The faculty and students assemble daily in the Chapel at 9:40 A. M. for public worship. On each Sunday morning at 10:45, Chapel exercises are conducted by some prominent clergyman invited for the occasion. In all these services, the object is to emphasize and enforce the principles of morality and of the Christian religion.

There are nine different denominational churches in Ames, all of which are closely in touch with and cordially invite the students to coöperate with them in all of their religious services.

ALUMNI ASSOCIATION.

The Alumni Association of the Iowa State College was organized in 1876. Its purpose is to promote the highest interest of the institution and to increase the friendship and sympathy among the students and alumni.

The present officers of the association are: E. W. Stanton, '72, Honorary President; C. N. Dietz, '72, President; Mrs. Norma Hainer Beech, '87, Secretary; Mrs. Julia Wentch Stanton, Treasurer; and Mrs. Mary McDonald Knapp, '83, Historian. The annual business meeting and banquet are held on Wednesday and Thursday of Commencement Week. A local association was organized in April, 1903, in order to arrange for the annual meetings and to keep the alumni in close touch with one another. Branch associations have been organized in Des Moines, Washington, D. C., New York, Pittsburg, Chicago, Philadelphia, Schenectady and St. Louis.

The Alumni Hall adds much to the association, as it affords a place where all alumni can meet when visiting their Alma Mater.

COLLEGE PUBLICATIONS.

1. Catalogue, published in February, and giving general information about the College and its several departments.
2. College Compendium, an illustrated catalogue of the school.
3. Special announcements of the Agricultural, Veterinary and Engineering divisions, and of the Short Course and Good Roads School, one bulletin being published each month.
4. Bulletins recording the results of experimental studies carried on by the Agricultural and Engineering Experiment Stations.

STUDENT AND ALUMNI PUBLICATIONS.

1. The Student, a weekly paper, published by a staff elected from the student body and devoted to the recording of such matters as pertain to the interest and welfare of the school.
2. The Bomb, an annual published by the Junior Class.
3. Iowa Agriculturist, published monthly by the Agricultural Club of the Iowa State College.
4. Iowa Engineer, published bi-monthly by the Engineering Association.
5. The Alumnus, a monthly publication, devoted to and published by the Alumni Association.

LITERARY SOCIETIES.

The work of the nine literary societies serves not only to supplement the social and literary work of the College, but also aids the student in securing that training so necessary to enable one to appear before an audience, the training which every student needs and which cannot be secured in the class room alone. It is the purpose of the officers of the College to keep each Friday evening open that the work of these societies may go on without interruption. Every student is invited and urged to join one of these societies.

DEBATING LEAGUE.

The Debating League is an organization composed of the Bachelor, Crescent, Phileleutheroi, Philomathian, Pythian, Welch and Forum literary societies. Its function is to arrange for and carry out debates, both inter-society and inter-collegiate. There is an inter-society debate each semester, calling out four students from each society. Of these four students, two maintain the affirmative and two the negative, of the same proposition on the same night against opposing teams from other societies. During the year the inter-society contests give opportunity for forty-eight students to engage in vigorous debate and many others get practice in trying to win a place on their society teams. During the fall semester a debate is held with the Iowa State Normal School. Hereafter we will support a dual debate, thus calling out six debaters from each school. The triangular inter-collegiate debate with Drake University and Iowa College held during the spring semester also calls for six students to represent the Iowa State College. The debates arouse great interest, and to the participants, they bring great profit.

ORATORICAL ASSOCIATION.

The Oratorical Association is composed of three members from each of the literary societies and three from the faculty. This association, by providing for joint public programs, declamatory and oratorical contests, and society graduation, helps to increase the interest in the general literary work of the school.

Inter-society oratorical contests are held each fall semester and declamatory contests each spring semester, each society having one representative. The winner in the inter-society oratorical contest represents the College in the annual inter-collegiate contest in which Drake, Penn, Parsons, Upper Iowa University, Cornell, Des Moines, Coe, Lenox, Leander Clark, Tabor, Central University, Buena Vista College and Iowa State College are represented.

MUSICAL ORGANIZATIONS.

The College maintains a Choral Society, membership being open to students and citizens of Ames, a College Choir, a Male Glee Club, and a Ladies Glee Club, all of which give frequent concerts and recitals. The musical organizations are under the supervision of the Director of Music.

A College Band of thirty-two pieces is maintained under the instruction of Charles L. Mundhenk, a member of the Iowa State Band of 1893. This band furnishes music in connection with the Military Department and also for all athletic and student assemblies.

Division of Agriculture

Division of Agriculture

CHARLES F. CURTISS, DEAN.

SPENCER A. BEACH, VICE DEAN.

The division of Agriculture offers to its students work in any of the following courses:

Course in Agronomy.
Course in Dairying.
Course in Animal Husbandry.
Course in Horticulture.
Course in Agricultural Engineering.
Course in Science and Agriculture.

These courses are so arranged as to furnish a good foundation from which a student may become either a successful farmer or may develop into a specialist in one of the many branches of the Agricultural industry. The department offers short as well as the regular four year courses, the difference being due largely to the degree in which the student wishes to specialize in any line of work. The farm as it is usually couducted is a union of many divisions of industry, and the shorter course confines itself to laying a foundation that will secure success in all of these, while the longer course seeks to direct the student into that line which will call forth and centralize his special ability and at the same time enable him to meet the variety of conditions that under all circumstances surround a successful life.

Past experience with these courses shows that they have met with more than the usual success in attaining their objects; as the shorter course has been productive of many successful farmers, and the longer course has been unusually successful in developing better farmers and more capable men in practical life and also in securing for our graduates prominent positions in the agricultural faculties of other colleges.

In the courses in practical agriculture, a field of work which is unsurpassed by any other college in the United States is open to our students. The national government gives to the college about thirty-five thousand dollars annually for original experimentation and instruction in agriculture and the sciences related to this industry. This supplemented by liberal state aid, enables the College authorities to make the fields and the barns veritable laboratories of extensive and most practical investigation and observation. The range is from the soil which produces, through all of its natural characteristics to whatever is grown in agriculture from germ to finish.

The farm consisting of 1200 acres of rolling prairies, bottom and woodland is stocked with good representatives of six breeds of horses, seven breeds of cattle, seven breeds of sheep and six breeds of hogs. These animals are used in class illustration and for the various experiments in breeding and feeding for milk, meat, wool, growth and maintenance, conducted by the Experiment Station as a department of the College. All the crops are grown for some educational purpose; all the animals are fed by rule and system, and the result of their management reported upon and used in class work.

Two commodious, well-lighted stock judging pavilions have recently been constructed, into which live animals are brought in the presence of the teacher and the class for careful study and intimate knowledge. An experimental barn with the recent and most approved methods of stalls, feeding and ventilation, is devoted exclusively to the original work of animal husbandry and agronomy, the work ranging over all the questions of breeding and maturing domestic animals.

The work of this department is designed to teach the sciences that underlie practical agriculture, and sufficient English, literature, mathematics, history, and other supplementary studies to sustain both scientific and practical agriculture and to develop the agricultural students to the level of the educated in any profession. Special attention is given to the improved methods in all of the various operations of farming, farm building, use of tools and machinery, and management of all kinds of stock and crops. The instruction embraces not only the principles but also the practices of agriculture.

AGRICULTURAL COURSE.

All students classified in the courses in Agronomy, Dairying, Animal Husbandry and Horticulture will take the same work until the beginning of the Sophomore year, when the selection of the desired course will be made by the student. Students classified in the courses in Agricultural Engineering and Science and Agriculture will take the Freshman work as shown in the list of studies given for those courses.

Academic Year.

The Academic studies will not be required except so much as may be necessary to make up the thirty required and elective credits for admission to the Freshman Year. See Index for Admission to the College.

A SEMESTER.

		Required Semester Hours
Mathematics 3,	Algebra Review	5
English 2,	Rhetoric and Composition	5
Modern Language—		

The Language selected will be continued through the Academic Year.

Language 1,	French 5	5
Language 5,	German 5	
Language 30,	Spanish 5	
Botany 1	Elementary Botany	2
Public Speaking 2,	The Declamation	1
	Total Semester Hours	18

B SEMESTER.

		Required Semester Hours
Mathematics 5,	Plane Geometry	5
Literature 12,	English Classics	4
Modern Language—		

The Language selected must be a continuation of the one chosen at the beginning of the Academic Year.

Choice	Language 2,	French 5	5
	Language 6,	German 5	
	Language 31,	Spanish 5	
	History 16,	The National Period	3
		Total semester hours	17

**Freshman Year.

FIRST SEMESTER.

		Required Semester Hours
Agricultural Engineering 1 or 2,	Shop Work	2
Animal Husbandry 1,	Market Types of Cattle and Sheep	2
Farm Crops 1,	Corn Growing and Judging	3
Horticulture 14,	Farm Forestry	3
Veterinary 56,	Anatomy of Domestic Animals	1
English 10,	Narration and Description	3
Mathematics 17,	Algebra and Trigonometry	3
History 19,	The Making of the Nation 1783-1817	2
Military 1,	Military Drill	..
Library 1,	Library Instruction (4 hours during the semester)	
	Total semester hours	19

**Freshmen who show deficient preparation in English or Mathematics may be assigned by the Dean of the Junior College and the Dean of Agriculture, to special classes, with one credit hour more work than indicated above, or in case of clear indication of failure, even with this arrangement, they may be assigned to Academic classes.

SECOND SEMESTER

		Required Semester Hours
Agricultural Engineering 1 or 2,	Shop Work	2
Animal Husbandry 2,	Market Types of Dairy Cattle, Horses and Swine	2
Dairying 12,	Farm Dairying	3
Farm Crops 2,	Grains, Grasses and Forage Crops	3
Horticulture 2,	Plant Propagation	3
English 11,	Exposition	3
Physics 205,	Mechanics, Heat and Light	3
Military 2,	Military Drill	..
	Total semester hours	19

Department of Agronomy

Agronomy is the science of the Field and its crops. It treats of Farm Management, the application of economic business methods to farm practices; Field Crops, their classification, production and improvement; Soils, their fertility, cultivation and improvement; and Agricultural Engineering, the tools, machinery, fences and drains of the farm. The Department of Agronomy consists of the three coördinate Departments, Farm Crops, Agricultural Engineering and Soils.

COURSE IN AGRONOMY.

For Freshman year, see Agricultural Course, page 65.

Sophomore Year.

THIRD SEMESTER.

		Required Semester Hours
Agricultural Engineering 4,	Farm Engineering	4
Farm Crops 3,	Corn Breeding and Judging	2
Animal Husbandry 3,	Breed Types of Cattle and Sheep	4
Horticulture 3,	Orcharding	3
Agricultural Chemistry 21,	Elementary Experimental Chemistry	5
English 12,	Argumentation	2
Military 3, or Athletics		..
	Total semester hours	20

FOURTH SEMESTER.

		Required Semester Hours
Agricultural Engineering 5,	Farm Machinery and Farm Motors	3
Farm Crops 4,	Grain Breeding and Judging	2
Animal Husbandry 4,	Breed Types of Dairy Cattle, Horses and Swine	4
Zoology 16,	General Zoology	5
Agricultural Chemistry 23,	Elementary Experimental Chemistry	5
Military 4, or Athletics		..
	Total semester hours	19

Junior Year.

FIFTH SEMESTER.

				Required Semester Hours	
	Soils 1,	Soil Physics		4	4
	Agricultural Chemistry 25,	Agricultural Analysis		4	4
	Animal Husbandry 21,	Principles of Breeding		2	2
Choice	Zoology 4,	Entomology	4	4 or 5	
	Mathematics 8,	Analytical Geometry	5		

Students who elect Mathematics 8 will be required to take Mathematics 9 and Physics 404.

Economic Science 9,	Outlines of Economics	3	3
		17 or 18	

Elective

The Student will select from the list of electives on page 122 enough work to make a total of from 17 to 20 hours per week. 0 to 2

Total semester hours 17 to 20

SIXTH SEMESTER.

				Required Semester Hours	
	Soils 2,	Soil Fertility		4	4
Choice	Farm Crops 9,	Research Work	3	3	3
	Agricultural Engineering 9	Research Work	3		
	Soils 3,	Research Work	3		
	Botany 30,	General Bacteriology		4	4
Choice	Botany 11,	Vegetable Physiology	4	4 or 5	
	Mathematics 9,	Calculus	5		

Students who elect Mathematics 8 in first semester Junior must elect Mathematics 9.

	15	16
Elective The Student will select from the list of electives on page 122 enough work to make a total of from 16 to 20 hours per week.	1 to	4
Total semester hours	16 to	20

Senior Year.

SEVENTH SEMESTER.

			Required Semester Hours
	Farm Crops 8,	Farm Management	3
	Soils 8,	Soil Bacteriology	3
Choice	Soils 4,	Research Work 3	3
	Agricultural Engineering 10,	Research Work 3	
	Farm Crops 9 or 10,	Research Work 3	
	Animal Husbandry 20,	Animal Feeding	2
	Botany 5,	Vegetable Pathology	3
			14
	Elective The Student will select from the list of electives on page 122 enough work to make a total of from 16 to 20 hours per week.		2 to 6
		Total semester hours	16 to 20

EIGHTH SEMESTER.

				Required Semester Hours
Choice	Agricultural Engineering 11,	Thesis 3		3 or 5
	Agricultural Engineering 12,	Thesis 5		
	Farm Crops 15,	Thesis 3		
	Farm Crops 16,	Thesis 5		
	Soils 11,	Thesis 3		
	Soils 12,	Thesis 5		
Choice	Horticulture 4, and	Plant Breeding	3	4 or 5
	Botany 24,	Embryogeny	1	
	Physics 404,	Electricity, Magnetism, Light and Sound	5	

Students who elect Mathematics 8 and 9 will take Physics 404.

	7 to 10
Elective The Student will select from the list of electives on page 122 enough work to make a total of from 16 to 20 hours per week.	9 to 13
Total semester hours	16 to 20

Farm Crops Department

M. L. BOWMAN, PROFESSOR.
H. G. BELL, ASSISTANT PROFESSOR.
B. W. CROSSLEY, ASSISTANT PROFESSOR.
A. E. NELSON, EXTENSION WORK.

The new equipment installed in the Farm Crops Department enables it to give most efficient work in all of its courses. There has been installed a new chemical laboratory which is for the special use of advanced students and post graduate students which offers special inducement to students desiring to fit themselves for college or experimental work.

The grain laboratory situated on the second floor of the stock and grain judging pavilion has been supplied with the most modern equipment, making it the best and most completely equipped laboratory of its kind.

The demand for competent men trained along farm crops lines is rapidly increasing. Farm managers are especially needed to fill positions on both large and medium sized tracts of land, at good salaries. Likewise men well trained along the line of farm crops are constantly in demand by large seed establishments and by the agricultural press. It is the purpose of the Farm Crops Department to help students fit themselves along these practical lines. The following courses are offered:

WINTER COURSES IN CORN AND GRAIN JUDGING.

January 3, 1910, to January 15, 1910.

A short course in corn and grain judging has been established in order to meet the demand for instruction in this work. This course begins January 3, 1910, and continues two weeks.

Instruction will be given in the methods of selecting, testing, and preparing seed for planting; in the methods of cultivation; and the characteristics and adaptability of different varieties of corn to various sections of the state. A comparison of corn cultivators, and of planter tests with both rotary and edge-drop planters will be made.

This course is especially planned for the farmer who cannot take advantage of the work of the regular College course. Those wishing to become corn judges, qualified to judge corn at farmers' institutes, fairs, and expositions, will have an opportunity at this corn school to fit themselves for this work.

Samples of all the leading varieties of corn grown in Iowa will be on exhibition and will be used for judging purposes. A fire proof two-story stock and grain judging pavilion has been erected for this work. An examination will be held at the close of the school, and corn judging certificates will be issued, by the Iowa Corn Growers' Association, to those who prove themselves proficient.

The equipment of the Grain Judging Pavilion, which has been installed at a cost of $3,000, offers excellent facilities for small grain judging. The study of commercial grading of wheat, oats, barley and rye is also given careful attention. This work is taken up on a basis that is very similar to the grading practiced in the Chicago markets.

To partially cover the expense of additional instructors and facilities for judging, a fee of $3.00 to residents and $5.00 to non-residents will be charged, the one fee covering the instruction in either grain and stock judging, or in grain judging and horticulture. The work during the course will be so arranged that the students' time will be equally divided between either grain and stock judging, or grain judging and horticulture.

METEOROLOGY AND CLIMATOLOGY.

The object of the course is to give the student a knowledge of the fundamental principles which govern weather and climate. The first half of the term is devoted to a study of the elementary principles of meteorology. The student is acquainted with the instruments used by the weather bureau, the principles upon which they are based, and their care and uses are explained. The last half of the term is given to a consideration of the fundamental principles which control weather and climate. Throughout the entire course the charts and maps issued by the state and federal weather bureaus are used freely. The student is given practice on the construction and interpretation of charts and in forecasting. See write-up under Geology.

COURSES IN FARM CROPS.

1. **Corn Growing and Judging.** First semester Agricultural Course. Includes study of methods of selecting, testing, grading, planting, cultivating, harvesting and storing of corn, corn judging, commercial handling of corn, cost of production and uses of crop, the different conditions affecting the stand and quality of crop as studied in class room and under field conditions. Study is made of the different types of corn, including the kernels, ears and groups of ears, together with practice in selecting, germinating and grading corn and in calibrating the planter.

Three hours credit. Recitations, two hours, and laboratory, two hours per week. Fee, $1.50.

2. **Small Grains, Grasses, and Forage Crops.** Second semester Agricultural Course. Includes study of grains and other field crops; their adaptation to soil and climate, conditions affecting growth, methods of culture, principles underlying reproduction, germination, plant growth and improvement; also score card practice in small grains. Three hours credit. Recitations, two hours and laboratory, two hours per week. Fee, $1.50.

3. **Corn Breeding and Judging.** Third semester Agronomy and elective Agricultural Courses. Includes a detailed study of all the leading varieties of corn, their origin, history, and adaptation to the different localities. Also a careful study of the best methods to be employed in the improvement of corn by selection and breeding. Corn judging will be a special feature of the work. The distinguishing characteristics of the different varieties of corn will be given careful attention. Two hours credit. Laboratory and lectures, four hours per week. Fee, $2.00.

4. **Grain Breeding and Judging.** Fourth semester Agronomy and Science and Agriculture Courses and elective Agricultural Courses. Includes a detailed study of all the leading varieties of small grains, their origin, history, and adaptation to the different localities, also a careful study of the best methods to be employed in their improvement. Grain judging will be one of the chief features of the work, together with a study of the weed seeds found in the commercial grades of these grains. The distinguishing characteristics of the different varieties will be studied, also the uses to which the small grains are put. Two hours credit. Laboratory and lectures, four hours per week. Fee, $2.00.

8. **Farm Management.** Seventh semester Agronomy and Agricultural Engineering, elective Agricultural Courses. This course includes the study of the different systems of extensive and mixed farming, problems confronting the farmer, circumstances influencing agricultural practices, the hired help, fencing, live stock, and a study of the methods pursued by our most successful farmers. A practical and thorough study of farm accounts is made a special feature. The extensive coöperation which the Farm Crops Department is having along the line of farm management with a large number of the best farmers of the state helps to make this a most practical course in systematizing the general farm practices. Three hours credit. Fee, $2.00.

9. **Research Work in Farm Crops.** Sixth semester or seventh semester Agronomy by those students who do not elect research work in Agricultural Engineering or Soils. Original experimentation and study of special problems relating to cereal, forage, root and other crops. Experiments may be conducted in greenhouse or field. Includes the testing of vitality, purity of seeds, pollination and diseases of grains and their treatment. Prerequisites, Farm Crops 1 and 2. Three hours credit. Laboratory, six hours per week. Fee, $2.00.

10. **Advanced Research Work in Farm Crops.** Elective Agricultural Courses. Original investigation in the chemistry of various field crops, including composition of the cereals and forage crops subject to different conditions and other questions treating upon the economic production and use of farm crops. Especially equipped Farm Crops Chemical Laboratory furnishes excellent facilities for this work. This course offers special advantages for thesis work. Three hours credit. Laboratory, six hours per week. Fee, $5.00.

11. **Advanced Corn Judging.** Elective first semester Agricultural Courses. Intended to fit students more thoroughly to become competent corn judges at institutes and fairs or specialists in corn production. The time is devoted entirely to the judging of corn. All the leading varieties are given special consideration. Prerequisite, Farm Crops 3. Three hours credit. Laboratory, six hours per week. Fee, $2.50.

12. **Advanced Grain Judging.** Elective second semester Agricultural Courses. This course is intended to fit students more thoroughly to become competent grain judges and to fill positions as grain inspectors. The work in the grading of grain will be practically the same as that carried on by the Chicago Board of Trade, and supplies an excellent opportunity for students desiring to make special study along these lines. Together with the smaller cereals, the commercial grading of corn will also receive attention. Prerequisite, Farm Crops 4. Two hours credit. Laboratory, 4 hours per week. Fee, $2.50.

15. **Thesis.** Eighth semester Agronomy. Must be upon some subject requiring original work in Farm Crops. Three hours credit.

16. **Thesis.** Same as Farm Crops 15 except five hours credit.

GRADUATE WORK IN FARM CROPS.

Graduate work may be taken in advanced grain judging. This consists of original investigation of any farm crop or crops, they being treated from both the scientific and practical standpoint. This work is designed to train students to hold positions with seed firms, in agricultural experimental work, along special seed or crop lines in the United States Department of Agriculture, or to still further prepare them to solve the complex problems of the farm. Having access to the fields and to the excellent laboratory facilities which are offered, post graduates may obtain a very thorough course from both the scientific and practical standpoint.

COMMERCIAL JUDGING AND GRADING OF GRAINS.

An opportunity for study along the lines of commercial judging and grading of grains is also offered, thus preparing graduates for positions as grain inspectors. A graduate of any institution who has not had the equivalent of the work offered in the previous courses in Farm Crops, will be given an opportunity for taking a special course in judging and grading cereals and forage crops. A student pursuing advanced work in the commercial grading of grains must have six weeks training under an efficient inspector at an important grain center before completing the course.

Department of Soils

WILLIAM HENRY STEVENSON, PROFESSOR.

JOSEPH F. BARKER, INSTRUCTOR.

A. H. SNYDER, EXTENSION WORK.

A knowledge of the fundamental principles which underlie all successful systems of soil management should be the possession of every farmer. Without this knowledge he cannot produce maximum crops nor successfully maintain the fertility of his soil. And yet no greater obligation rests upon the American farmer than the conservation of our greatest natural resources, namely the productive power of the land. It is the aim of the Soils Department to teach in a logical way the important principles concerning physical, plant food and bacteriological soil factors. In order that this work may be carried on successfully, several courses are offered undergraduate and graduate students, including courses in Soil Physics, Soil Fertility and Soil Bacteriology.

On the first floor of Agricultural Hall, a commodious and well appointed soil laboratory, accommodating seventy-five students, has been thoroughly equipped for accurate and scientific work. Apparatus of the latest design has been installed in this laboratory, thus affording excellent facilities for regular, advanced and graduate students in Soils.

The laboratories and equipment which will be used by the Soils Department in the new Agricultural building are superior in every respect and will place at the disposal of students unequaled opportunities for work of the highest grade. Without doubt, these laboratories in the new Agricultural building will be ready for occupancy September 1, 1909.

In addition to these excellent laboratory facilities, suitable greenhouses and field plots are available for certain lines of study and experimentation.

The Department is also equipped with photographs, charts and maps which are used in the lecture room and laboratory. Valuable and abundant data, which have been secured by the Soils Section from extensive soil experiments, prove very helpful to students who are specially interested in the problems relating directly to the soils of Iowa.

The work of the Department is two-fold; first to fit young men to successfully solve the soil problems which are an integral part of every farmer's experience; secondly to fit some students to creditably fill positions in Agricultural colleges and Experiment stations and in other institutions in which the subject of Soils is taught. There is a constantly increasing demand for men well trained in Soils.

COURSES IN SOILS.

1. Soil Physics. Third semester Horticulture and Forestry, and fifth semester Agronomy, Animal Husbandry, Agricultural Engineering, and Science and Agriculture; elective Dairy. This course comprises a study of the origin, formation and classification of soils; soil moisture and methods of conserving it; the principles which underlie dry farming; soil temperature, and conditions influencing it; soil texture as affecting heat, moisture and plant food; surface tension, capillarity, osmosis, and diffusion as affecting soil conditions; the effect upon the soil and the crop of plowing, harrowing, cultivating, cropping, and rolling; washing of soils and methods of preventing the same; preparation of seed beds; cultivation and drainage as affecting moisture, temperature, root development and the supply of available plant food. The work also comprises the determination of the specific gravity, apparent specific gravity, volume weight, porosity, water-holding capacity, and capillary power of various soils; also a study of the effect of mulches on the evaporation of water from the soil and the physical effects upon the soil of different systems of rotation and of continuous cropping. Prerequisite, Physics 205. Four hours credit. Lectures and recitations, two hours, and laboratory, four hours, per week. Fee, $3.00.

2. Soil Fertility. Sixth semester Agronomy, Animal Husbandry, Horticulture and Forestry, Agricultural Engineering, and Science and Agriculture and elective Dairy Course. Maintenance of Fertility; Fertilizers and Rotations. The influence of commercial fertilizers, barnyard manure, and green manure upon the quality and yield of various crops; the effect of different crops upon the fertility of the soil and upon succeeding crops; different systems of rotation and the effect upon the productiveness of the soil of various methods of soil management; also a study of the storing, preserving, and application of farmyard manure.

This work is supplemented by a study of manures, fertilizers and soils; their composition and agricultural value. Pot and field experiments are conducted to show the influence of fertilizers, applied to the soil in different quantities and at different times, upon the quality and yield of various crops. Special attention is given to leguminous crops as fertilizers and their place in crop rotation. A study is made of special types of soil which are found in different sections of the state, such as clay, gumbo, loess, and peat, with special reference to the best methods of handling and cropping these soils. Prerequisites, Soils 1, and Chemistry 25. Four hours credit. Lectures and recitations, two hours, and laboratory, four hours, per week. Fee, $5.00.

3. Research Work in Soil Physics. Sixth semester Agronomy for all students who do not elect research work in Farm Crops or Agricultural Engineering; elective seventh or eighth semester Agricultural Courses. Experimentation and study of special problems relating to the physical characteristics of soils and their relation to crop production. Experiments may be carried on in the laboratory, greenhouse or field.

Modern laboratory and greenhouse facilities offer to the student an excellent opportunity for research work from the standpoint of Soil Physics. A wide range of special subjects is afforded the student. This course offers special advantages for a study of the physical composition of Soils. Prerequisite, Soils 1. Three hours credit. Laboratory, six hours per week. Fee, $2.00.

4. **Research Work in Soil Fertility.** Seventh semester Agronomy for all students who do not elect research work in Farm Crops or Agricultural Engineering; elective seventh or eighth semester Agricultural Courses. Experimentation and study of special problems relating to maintaining and increasing the productive capacity of soils. This course is designed to enable the student to study one or more types of soil in which he may be specially interested, and also to study the effect of certain systems of soil management upon the plant food content and productive capacity of soils. This course offers special advantages for pot culture investigations and for a study of the chemical composition of soils. Prerequisites, Soils 1 and 2. Three hours credit. Laboratory, six hours per week. Fee, $2.00.

6. **Advanced Soil Fertility.** Elective seventh semester Agricultural Courses. This course includes a study of the plant food content and productiveness of particular types or classes of soils; the relation of the plant and soil, such as the influence of acidity and alkalinity, and also the influence of root excretions and of organic materials; the effect of fertilizing materials upon the growth, yield and quality of various crops as determined by pot culture and field experiments; methods of conducting fertility investigations and presenting data. Lectures will be given and the students will make a careful study of the fertility investigations which have been made by the Experiment Stations of this and other countries. Special emphasis will be placed upon the data from these investigations which tend to establish practical systems of soil management. This course is also intended for the student who desires to study the methods of experimentation which are employed by leading investigators along soil fertility lines. Prerequisites, Soils 1 and 2. Two hours credit. Lectures and recitations, two hours per week. Fee, $1.00.

7. **Investigation of Special Soils.** Elective eighth semester Agricultural Courses. Soils 10 is required of students classified in this course. This work includes a study of the soil investigations which have been made at the Rothamsted Experiment Station with special reference to the effect of different systems of soil management upon the productive capacity of the soil. This course affords the student an opportunity to study and discuss the great mass of data which has been collected during a period of more than half a century at the most famous experiment station in the world. Prerequisites, Soils 1 and 2. One hour credit. Lectures and recitations, one hour per week. Fee, $1.00.

8. **Soil Bacteriology.** Seventh semester Agronomy, elective Agri-

cultural Courses. A study of those organisms found principally in the soil, including a study of the decomposition of nitrogenous and carbonaceous matter, nitrification, dentrification and the assimilation of atmospheric nitrogen, thus furnishing the student with a knowledge of the relation of bacteria to the soil and to plant growth. Prerequisites, a knowledge of chemistry and general bacteriology. Three hours credit. Lecture, one hour, and laboratory, four hours, per week. Fee, $4.00.

10. Soil Seminar. Eighth semester of students classified in Advanced Laboratory work in Soil Physics (Soils 15); Advanced Laboratory Work in Soil Fertility (Soils 16); Investigation of Special Soils (Soils 7) or Thesis (Soils 11 or 12). Consists of preparation, presentation and discussion of papers upon special assigned topics in Soils. The papers must be carefully written and submitted to the professor in charge. One hour credit. One hour per week.

11. Thesis. Eighth semester Agronomy. Stndents who take this course are also required to take Soils 10. Must be upon some subject requiring original investigation, taken in Farm Crops, Agricultural Engineering or Soils. Three hours credit.

12. Thesis. Same as Soils 13, except has five hours credit. Students who take this course are also required to take Soils 10.

13. Soil Surveying and Mapping. Fifth semester Horticulture and Forestry, and elective Agricultural Courses. This course includes a further study of the physical properties of Soils and their physical composition as determined by mechanical analysis. The preparation of large scale plane table maps of selected areas and a detailed survey of the soils. Also a study of the relation of topography and the physical and chemical composition of soils to the character and growth of the native vegetation. The principles underlying the adaptability of particular soils to different kinds of forest and fruit trees, and to various farm and garden crops. Prerequisites, Soils 1 and 2. Two hours credit. Lectures and recitations, one hour, and laboratory, two hours, per week. Fee, $2.00.

14. Advanced Soil Bacteriology. Elective, eighth semester Agricultural Courses. A continuation of the work given in Soils 7. Soils 10 is required of students classified in this course. Prerequisite, Soils 7. Three hours credit. Lecture one hour, and laboratory four hours, per week. Fee, $4.00.

15. Advanced Laboratory Work in Soil Physics. Elective Agricultural Courses. Students who take this course are also required to take Soils 10. Study of the physical composition of soils by mechanical analysis and petrological examination; the determination of the temperature, moisture, and soluble salt content of various soils under field conditions, including methods of testing for alkali soils. Green house, laboratory and field experiments are conducted to determine the effect upon soil conditions of different methods of soil management; the work also includes assigned readings, study of results of previous investigations, and written reports of results of experiments and investigations made by the student. Prerequisite, Soils 1. Two hours credit. Laboratory, four hours per week. Fee, $2.00.

16. **Advanced Laboratory Work in Soil Fertility.** Elective Agricultural Courses. Students who take this course are also required to take Soils 10. A detailed study of the chemical composition of soils, the analysis of typical soils of the state, or any particular locality, with special reference to the determination of humus, nitrogen, phosphorus, potassium and lime. Physiological soil analysis by the parrafin wire basket method and larger pot cultures, and by the growing of plants in aqueous extracts of soils. The work also includes assigned readings, study of results of previous investigations, and written reports of results of experiments and investigations made by the student. Prerequisite, Soils 2. Two hours credit. Laboratory, four hours per week. Fee, $2.00.

GRADUATE WORK IN SOILS

Graduate work is offered in Soils which prepares the student for special work in the United States Bureau of Soils or in Colleges and State Experiment Stations. The work may be taken in either Soil Physics or Soil Fertility as a continuation of work taken as an undergraduate in this college or of any line of soil study which has fitted the student to pursue advanced work.

The graduate student will find excellent opportunities for investigations in soils along any of the following lines:

(A) The relation of soil types to crop production; (B) Soil types; Methods of surveying and mapping; (C) The management of certain types of soil to improve their physical condition; (D) The mechanical composition of soils; Its influence upon the physical properties affecting crop production; (E) Erosion of soils and methods of prevention; (F) The relation of farm manures, fertilizing materials and crop rotations to the maintenance of fertility; (G) Pot culture, bottle and wire basket investigations to determine the manurial requirements of soils; (H) The comparative value of important types of soils based upon their composition; (I) Methods of investigating the soils of a state; (J) Methods of rendering more productive certain types of soil, such as sandy, peaty and loess soils; (K) The relation of the organic matter content of soils to crop yields with special reference to the changes which take place in the plant food content and in the physical condition of the soil; (L) The soils of the United States with special reference to crop adaptation.

The graduate student is not limited to these lines of investigation; he may work on any subject which meets the approval of the head of the department.

Department of Dairying

MARTIN MORTENSEN, ASSOCIATE PROFESSOR.
JOHN BOWER, ASSISTANT PROFESSOR.
THOMAS E. CULP, ASSISTANT.
HERMAN HORNEMAN, EXTENSION WORK.
A. H. CHADSEY, REFRIGERATION ENGINEER.

The work of the Dairy Department is that of giving instruction and training to fit men for the various callings in dairying, of Experimentation and the investigation and discovery of facts relating to this industry.

Owing to the rapid progress and the application of scientific principles to the dairy industry, it is necessary that those engaged in this work should keep in touch with new ideas and principles. In order to meet this demand, the dairy department offers first, a four year course for qualifying students to become competent teachers and investigators of dairying in agricultural colleges and experiment stations, inspectors of dairy products and creameries in municipal, state and government service, or superintendents of large creameries or dairy farms; second, one year course, for fitting students for becoming operators of creameries, cheese factories, and dairy farms; and third, a two weeks' short course, for acquainting experienced dairy and creamery men with new methods and investigations which they cannot learn in their own factories.

The Dairy Department with its new building and the Dairy farm with its herd, offer unexcelled facilities for teaching Dairying in a thoroughly practical and scientific manner. The dairy farm of 200 acres, is well stocked with various types and breeds of milk cows. The milk from this herd together with the milk and cream shipped and hauled to the college supplies all the needs of the creamery.

The Dairy Building is a practical working creamery and cheese factory in operation throughout the year. The products made bring the highest quotations and have an enviable reputation in the markets of the United States and England.

The student becomes familiar with all the practical work connected with a commercial creamery, weighing the milk brought in by the patrons and testing the same, running the engines, caring for the factory rooms and machines, and shipping the butter. The aim is to teach not only how but why the work is so done. During the senior year, the students who have proven themselves capable, do original research work in the laboratory, the results of which if of value to others are reported in the bulletins of the Experiment Station.

The studies other than dairying offered in this course are such as give the student a knowledge of the scientific principles upon which this work depends and a broad and general education.

Students in all the dairy work are required to provide themselves with white suits, keep them clean and in good order.

WINTER COURSE IN DAIRYING

(January 3, 1910, to January 15, 1910.)

The prominent rank attained by students of the Iowa Dairy School in state and national contests has led to a demand for special instruction. A course in Butter Making and one in Farm Dairying are now offered during the winter in order to meet this demand.

In the course in Butter Making, special attention will be paid to the handling of hand separator cream so as to make the best grade of butter possible, the proper controlling of moisture and salt in butter, the removal of undesirable flavors from cream, the preparation of starters, the pasteurization of cream, and the analysis of butter.

This course is intended especially for experienced butter makers, inexperienced men not being admitted. A fee of $10.00 is charged for admission to this course in order to cover the expenses of securing extra instructors and of the materials used.

The course in Farm Dairying is especially intended for farmers, farmers' wives and daughters who are interested in improving the quality of dairy butter. The instruction given will include the care and testing of both milk and cream, best methods of manufacturing butter on the farm, and the construction and care of the hand separator. A fee of $2.00 is charged for admission to this course.

COURSE IN DAIRYING

For Freshman year, see Agricultural Course, page 65.

Sophomore Year.

THIRD SEMESTER

Agricultural Engineering 7,	Dairy Engineering	2
Animal Husbandry 3	Breed Types of Cattle and Sheep	4
Horticulture 3,	Orcharding	3
Agricultural Chemistry 21,	Elementary Experimental Chemistry	5
English 12,	Argumentation	2
Economic Science 9,	Outlines of Economics	3
Military 3, or Athletics,		
	Total semester hours	19

FOURTH SEMESTER

		Required semester hours
Dairying 11,	Cheese Making	4
Dairying 13,	Milk Testing and Milk Inspection	2
Animal Husbandry 4,	Breed Types of Dairy Cattle, Horses and Swine	4

Agricultural Chemistry 23,	Elementary Experimental Chemistry		5
Choice { Economic Science 10,	Agricultural Economics	3	3
Choice { History 6,	French Revolution and XIXth Century	3	
Military 4, or Athletics,			
	Total semester hours		18

Junior Year.

FIFTH SEMESTER

		Required semester hours
Dairying 14,	Advanced Butter Making	4
Animal Husbandry 21,	Principles of Breeding	2
Agricultural Chemistry 25,	Agricultural Analysis	4
		10

Elective:

The student will select from the list of electives on page 122 enough work to make a total of from sixteen to twenty hours per week 6 to 10

Total semester hours 16 to 20

SIXTH SEMESTER.

		Required semester hours
Dairying 16,	Technology of Milk	1
Dairying 24,	Fancy Cheese Making	3
Botany 30,	General Bacteriology	4
Agricultural Chemistry 26,	Agricultural Analysis	4
		12

Elective:

The student will select from the list of electives on page 122 enough work to make a total of from sixteen to twenty hours per week 4 to 8

Total semester hours 16 to 20

Senior Year.

SEVENTH SEMESTER

		Required semester hours
Dairying 17,	Dairy Bacteriology	4
Dairying 18,	Scoring Butter and Cheese	1

Dairying 19,	Seminar Work	2
Agricultural Chemistry 40,	Dairy Chemistry	4
Animal Husbandry 20,	Animal Feeding	2
Veterinary 44,	Sanitary Science	2
		15

Elective:

The student will select from the list of electives on page 122 enough work to make a total of from sixteen to twenty hours per week 1 to 5

Total semester hours 16 to 20

EIGHTH SEMESTER.

		Required semester hours
Dairying 20,	Factory Management	4
Dairying 21,	Preparation of Ice Cream and Ices	2
Dairying 23,	Thesis	2
Animal Husbandry 15,	Milk Production	1
		9

Elective:

The student will select from the list of electives on page 122 enough work to make a total of from sixteen to twenty hours per week 7 to 11

Total semester hours 16 to 20

COURSES IN DAIRYING

1. **Dairy Practice.** First and second semester one year Dairy Course. The first semester, practical work in butter making and cheese making, the second semester, in butter making. From five to seven hours in practical laboratory work per day.

2. **Buttermaking.** Second semester one year Dairy Course. It includes a study of the composition of milk and dairy products, the principles of gravity and centrifugal separation of cream, cream ripening, preparation of starters, churning, and preparation of butter for market. Sixteen lectures per semester.

3. **Milk Testing.** Second semester one year Dairy Course. A study of the Babcock test, and of the Farrington and Manns' test for determining acidity, the use of the lactometer for detecting adulterations, and also the composite sampling and testing of individual cows. One hour credit.

5. **Bookkeeping.** Second semester one year Dairy Course. Study

of the best form of bookkeeping for the factory business. One hour credit.

6. Dairy Bacteriology. First semester one year Dairy Course. Application of the principles of bacteriology in the care of milk, and in butter and cheese making. One lecture per week.

8. Cheese Making. First semester one year Dairy Course. Includes common and fancy cheese as Limburger, Brick, Swiss, Roquefort, Sage, Stilton, Pineapple, and Gouda. Sixteen lectures per semester.

For the above courses, all of which are offered in the one year Dairy Course, a fee of $10.00 per semester is charged.

10. Domestic Dairying. Elective Domestic Economy. Study of those dairy subjects that interest the housekeeper and dietetist. The important topics are: The nutritive and economic value of milk; its dietetics and hygiene; market milk, infants' milk, invalids' milk, cream, ice cream, condensed milk, milk chocolates, malted milk, dried milk, fermented milks (Kephir, Koumissete), buttermilk, butter, and cheese. Demonstrations are given in types of butter and cheese and in testing the purity of milk and butter. Two lectures per week. Fee, $2.00.

11. Cheese Making. Fourth semester Dairy Course and elective Agricultural Courses. A study of the importance of the quality and composition of milk in the manufacture of Cheddar cheese; the principles involved in cutting, heating, milling, salting and pressing the curd, curing and marketing; influence of organized and unorganized ferments in cheese; and the construction and ventilation of cheese curing rooms. Four hours credit. Recitation, one hour and laboratory, six hours per week. Fee, $3.00.

12. Farm Dairying. Second semester Agricultural Course. Includes a general study of the secretion, composition, testing, separation and acidity of milk, preparation of starters, ripening of cream, and churning and packing butter. Three hours credit. Recitation, two hours and laboratory, two hours per week. Fee, $3.00.

13. Milk Testing and Milk Inspection. Fourth semester Dairy Course, sixth semester Veterinary and elective Agricultural Courses. A study of the Babcock test, Farrington's and Manns' test for determining acidity, the use of the lactometer for detecting adulteration, composite sampling, and testing of individual cows, and detection of different preservatives and adulterations. Prerequisite Dairying 12. Two hours credit. Recitation, one hour, and laboratory, two hours, per week. Fee, $2.50.

14. Advanced Butter Making. Fifth semester Dairy Course and elective Agricultural Courses. A study of the physical and chemical properties. secretion and composition; separation of milk, cream ripening, the principles of churning, packing and marketing butter. Prerequisite, Agricultural Chemistry 21. Four hours credit. Recitations, two hours, and laboratory, four hours, per week. Fee, $3.00.

16. Technology of Milk. Sixth semester Dairy Course and elective Agricultural Courses. A study of the utilization of milk and its products, as the preparation of condensed, modified, and milk sugar, casein, and the food value of milk and its products. Prerequisites, Agricultural Chemistry 21, 23, and 25. Recitation, one hour per week. Fee, 50 cents.

17. Dairy Bacteriology. Seventh semester Dairy Course and elective Agricultural Courses. A study of the functions of bacteria and the application of bacteriological principles to dairy work. Prerequisites, Botany 30 and Chemistry 21, 23, 25 and 26. Four hours credit. Recitations, two hours, and laboratory, four hours, per week. $4.00.

18. Scoring Butter and Cheese. Seventh semester Dairy Course, first semester One Year Dairy Course, and elective Agricultural Courses. A study of the standard market requirements for dairy products, also the examination and scoring of butter and cheese. One hour credit. Fee, $3.00.

19. Seminar Work. Seventh semester Dairy Course. A study of various authorities on Dairying together with the work of the experiment stations on this subject. Prerequisites, Botany 40, Dairying 11 and 14. A knowledge of French and German is recommended. . Two hours per week.

20. Factory Management. Eighth semester Dairy Course, second semester One Year Dairy Course, and elective Agricultural Courses. Consists of the location, organization, constrsction, drainage, and ventilation of factories, the treatment of the by-products, and creamery refrigeration, thus qualifying a student to superintend or manage a large factory or dairy establishment. It is advisable for students to put in the laboratory during vacation or when work can be done during consecutive days. Prerequisite, Dairy 14. Four hours credit. Lecture, two hours, and laboratory, four hours, per week.

21. Preparation of Ice Cream and Ices. Eighth semester Dairy Course, and elective Agricultural Courses. A study of the preparation of ice cream, sherbets, and ices, made on a private or commercial scale. Both lectures and laboratory. Two hours credit. One recitation and one two hour laboratory. Fee, $2.50.

23. Thesis. Eighth semester Dairy Course. Original work on some dairy subject. May be worked out in co-operation with the departments of chemistry or bacteriology. Students should consult the professor concerning their subject at the beginning of their Senior year. Two hours per week.

24. Fancy Cheese Making. Sixth semester Dairy Course, and elective Agricultural Courses. Includes making the varieties found in the American market as Limburger, Swiss, Brick, Roquefort, Sage, Stilton, Pineapple, Gouda, Gorgonzola, and Neufchâtel. Three hours credit. Lecture, one hour, and laboratory, four hours, per week. Fee, $3.00.

ONE YEAR COURSE IN DAIRYING

The one year course in dairying is designed to meet the needs of those who want to acquire a knowledge of practical dairy methods as well as the scientific principles underlying the work. This course includes one college year beginning in August and ending in June. Students completing this course will be given certificates when evidence is furnished that they have successfully for one year operated a creamery or other dairy establishment.

ONE YEAR COURSE IN DAIRYING

FIRST SEMESTER.

		Required semester hours
Dairying 1,	Dairy Practice	6
Dairying 8,	Cheese Making	1
Agricultural Engineering 7,	Dairy Engineering	2
Animal Husbandry 19,	Feeding Dairy Stock	2
Chemistry 28,	Dairy Chemistry	2
Dairying 18,	Scoring Butter and Cheese	1
Dairying 6,	Dairy Bacteriology	1
	Total semester hours	15

SECOND SEMESTER.

		Required semester hours
Dairying 1,	Dairy Practice	6
Dairying 2,	Butter Making	1
Dairying 3,	Milk Testing	1
Dairying 5,	Bookkeeping	1
Dairying 20,	Factory Management	1
Animal Husbandry 18,	Breeding and Judging Dairy Stock	2
Chemistry 29,	Dairy Chemistry	2
	Total semester hours	14

Department of Animal Husbandry

W. J. KENNEDY, PROFESSOR.
WAYNE DINSMORE, ASSOCIATE PROFESSOR.
H. G. VAN PELT, ASSISTANT PROFESSOR AND SUPT. OF DAIRY FARM.
H. C. PIERCE, ASSISTANT PROFESSOR, POULTRY.
E. N. WENTWORTH, INSTRUCTOR.
W. H. PETERS, INSTRUCTOR.
R. K. BLISS, EXTENSION WORK.
R. E. DRENNAN, EXTENSION WORK.
W. A. LIPPENCOTT, STUDENT ASSISTANT, POULTRY.

The department of Animal Husbandry stands for all lines of work which pertain to the judging, selecting, breeding, feeding, development, care and management of the various breeds and classes of domesticated animals. Because of the importance of the live stock industry to the welfare of the state and because of the demand for instruction in this line, the equipment for instruction has been made as complete in every detail as possible.

The herds and flocks, established at an early date, have been added to from time to time until our equipment in this line, consisting of almost all recognized breeds of animals, places us in a position to do work in Animal Husbandry lines which cannot be accomplished in those institutions where such specimens are not furnished for instruction. Believing that training the eye is the only way to make a young man a proficient judge of live stock, the work of the lecture room and laboratory is demonstrated by the use of living specimens.

The two commodious judging pavilions, located near the barn, afford ample room for dividing the classes into many sections thus allowing individual work.

An excellent collection of horses representing all the market classes and the breeds of both light and heavy types is maintained for instruction purposes. Among these are good representatives of the Shires, Percherons, Clydesdales, French Coachers, Hackneys, Standard breds, and American Saddle Horses. Some of the horses are imported; while the others have been purchased with much care in their selection, from the best breeders on the continent.

More than two hundred head of cattle, representing all the leading beef, dual purpose, and dairy breeds are maintained on the farm. Complete breeding herds of most of the breeds are kept. An excellent collection of steers, representing the highest type of fat steer, and all the other classes and grades to be found in our leading markets down to the very lowest grades, is always available for class work. This affords our students an excellent opportunity to study the market demands and to know what constitutes each class, also why there is such a wide margin in the prices paid for cattle by the packer.

The dairy farm is well stocked with dairy cattle, including a herd of about a hundred representatives of the Holsteins, Jerseys, Guernseys, Ayreshires, milking Shorthorns, with good sires of the different breeds. This equipment affords an excellent opportunity for class work when studying the origin, history, and development of the different breeds of dairy cattle, their characteristics and the conditions under which they are evolved; also for carrying on investigations along the lines of breeding, feeding and management of the dairy herd for profit; and the relative values of home grown feed stuffs and by-products in the production of milk and butter fat.

The flock of sheep, consisting of over 200 head of seven different breeds, have been carefully selected to represent the type and characteristic of each breed, both in regard to form and wool bearing qualities. In addition to the breeding flocks, the department has a choice collection of fat wethers which affords an opportunity for the student to familiarize himself with the highest type of finished mutton sheep. All these are available for class work.

In the swine department, representatives of six breeds of the best American and British varieties are maintained. As in the other departments, the aim in this has been to keep in touch with the modern ideas of leading breeders, both in regard to breeding and the type of the animals in these breeds.

At all seasons of the year there is more or less feeding of market stock being done on the farm and in connection with the Experiment Station, so that excellent material is always available for instruction purposes regarding the qualities that add to the value of stock for the ordinary market. Having pure bred representatives, it is easy to inform the student in a practical way on the finer points of color, type, and other characteristics that relate to the pure bred classes of stock.

To assist further in this work, the herd books of the different American and foreign registry associations are being constantly added to the library. The College possesses the most complete set of the English Shorthorn herd books in existence in America. Through herd book study, the student is enabled not only to inform himself in regard to pedigrees, but he is enabled also to study the different scales of points which the breeders have adopted to represent the highest types of the various breeds.

The department is also equipped with photographs, charts, and lantern slides which are used in the lecture room when it is impossible to illustrate with the living animal. The abundant material available from the herds and flocks is used extensively in all lectures and score card practice. By means of score cards prepared by the department, the students are brought in close contact with the animals, and through them are informed on the points of market merit desirable in ordinary stock while later the use of the official scale of points for the different breeds in a similar way, makes them skillful in judging representatives of different breeds.

As soon as the student is familiar with the use of the score card, comparative judging is introduced. In comparative judging from four to six animals are used, and each student is required to place all the animals in order of merit, and write down clearly and concisely on a blank folder, prepared especially for this work, full reasons for making his awards. This kind of work teaches the student to compare animals and to balance the weak and the strong points of each in making his final awards. As soon as the student demonstrates his ability to place classes well, herd groups and sweepstake classes are introduced during his Senior year's work. This kind of work is similar to the most difficult judging done at our leading state fairs and international expositions. As soon as the student shows that he possesses the qualifications needed to judge stock in the show ring, he is sent out, in answer to the many requests from the secretaries, to judge various classes of stock at county fairs. This, in connection with his college work, results in establishing the lessons learned in the class room.

Positions Open for Men Trained Along Animal Husbandry Lines.

There is a great demand for competent young men trained along the lines of practical and scientific Animal Husbandry work, men who combine their college training with practical experience and native ability. Such is the training offered to the young men in this course. The demand for such students is unlimited at a compensation not exceeded in any other calling. A few of the many lines of work open to graduates of this department are: College and experiment station work, agricultural journalism, managers of stock farms, salesmen with commission merchants, buyers for the packing houses at the many stock yard centers, and salesmen of animal feedstuffs manufactured by the packing houses, glucose companies, linseed and cotton seed oil companies.

Clay, Robinson & Co. Fellowship Prizes.

Clay, Robinson & Co., Live Stock Commission Merchants, Union Stock Yards, Chicago, offer annually $1,000.00 in prizes to be awarded to the Agricultural Colleges making the best exhibit of live stock at the International Live Stock Exposition held at Chicago in December of each year. They stipulate that the money won by the various colleges shall be used for the establishment of fellowship prizes to be awarded to graduate students in the department of Animal Husbandry. These fellowships, amounting to $250.00 per student annually, are granted by the Board of Trustees upon the recommendation of the dean of the Division of Agriculture and the head of the department. A student holding a fellowship may pursue post-graduate work in Animal Husbandry.

WINTER COURSE IN STOCK JUDGING.

(January 3, 1910, to January 15, 1910.)

In response to a widespread demand for special short course instruction in the judging and feeding of animals, a two weeks' course has been established during the winter vacation. This course will begin January

3, 1910, and continue for two weeks. It will be devoted exclusively to score card practice, and judging of horses, cattle, sheep, and hogs, and lectures on feeding the same.

In this work special attention will be given to the selection of animals best suited for feeding purposes. Good specimens of the highest type of fat steers and ideal representatives of all the various breeds will be used for class work. At the conclusion of the cattle work a slaughter test and block demonstration of the various market types of steers will be conducted under the supervision of John Gosling, Kansas City, Missouri. This course is intended especially for the man on the farm that cannot avail himself of the opportunity to take a complete course.

A special course in corn judging will be given at the same time and the work will be so arranged that all those present may take both lines of work.

To cover in part the expense of procuring additional help and stock for demonstration, a tuition fee of $3.00 for residents and $5.00 for non-residents will be charged for admission to this course, but one fee will cover the instruction in both grain and stock judging.

COURSE IN ANIMAL HUSBANDRY.

For Freshman year, see Agricultural Course, page 65.

Sophomore Year.

THIRD SEMSTER.

		Required semester hours
Animal Husbandry 3,	Breed Types of Cattle and Sheep	4
Agricultural Engineering 4,	Farm Engineering	4
Zoology 2,	General Zoology	5
Agricultural Chemistry 21,	Elementary Experimental Chemistry	5
Horticulture 3,	Orcharding	3
Military 3, or Athletics		
	Total semester hours	21

FOURTH SEMESTER.

Animal Husbandry 4,	Breed Types of Dairy Cattle, Horses and Swine	4
Agricultural Engineering 5,	Farm Machinery and Farm Motors	3
Zoology 3,	General Zoology	5
Agricultural Chemistry 23,	Elementary Experimental Chemistry	5

Botany 26,	Ecology	2
English 12,	Argumentation	2
Military 4, or Athletics,		
		—
	Total semester hours	21

Junior Year.

FIFTH SEMESTER.

		Required semester hours
Animal Husbandry 11,	Feeding and Management of Live Stock	2
Animal Husbandry 31,	Poultry Management	3
Agricultural Chemistry 25,	Agricultural Analysis	4
Soils 1,	Soil Physics	4
Zoology 5,	Embryology	3
		—
		16

Elective:

The student will select from the list of electives on page 122 enough work to make a total of from sixteen to twenty hours per week 0 to 4

— —

Total semester hours 16 to 20

SIXTH SEMESTER.

		Required semester hours
Animal Husbandry 8,	Animal Breeding	2
Animal Husbandry 12,	Feeding and Management of Live Stock	2
Animal Husbandry 37,	Advanced Poultry Management	3
Soils 2,	Soil Fertility	4
Zoology 8,	Animal Parasites	2
Agricultural Chemistry 26,	Agricultural Analysis	4
Animal Husbandry 22,	Seminar	1
		—

Elective:

The student will select from the list of electives on page 122 enough work to make a total of from sixteen to twenty hours per week 0 to 2

— —

Total semester hours 18 to 20

Senior Year.

SEVENTH SEMESTER.

		Required semester hours
Animal Husbandry 6,	Advanced Live Stock Judging	2
Animal Husbandry 9,	Animal Nutrition and Packing House By-Products	2
Veterinary 19,	Obstetrics	1
Veterinary 44,	Sanitary Science	2
Veterinary 55,	Anatomy of Domestic Animals	2
		9
Elective: The student will select from the list of electives on page 122 enough work to make a total of from sixteen to twenty hours per week		7 to 11
	Total semester hours	16 to 20

EIGHTH SEMESTER.

		Required semester hours
Animal Husbandry 7,	Herd Book Study	2
Animal Husbandry 10,	Thesis	2
Animal Husbandry 13,	Advanced Work in Beef Production	1
Animal Husbandry 14,	Advanced Work in Pork Production	1
Animal Husbandry 15,	Milk Production	1
Animal Husbandry 16,	Advanced Work in Mutton and Wool Production	1
Animal Husbandry 17,	Advanced Work in Horse Feeding	1
Animal Husbandry 23,	Seminar	1
Veterinary 16,	Horse Shoeing	2
Veterinary 18,	Conformation and Soundness	2
Zoology 6,	Evolution of Animals	1
		15
Elective: The student will select from the list of electives on page 122 enough work to make a total of from sixteen to twenty hours per week		1 to 5
	Total semester hours	16 to 20

COURSES IN ANIMAL HUSBANDRY.

1. **Market Types of Cattle and Sheep.** First semester Agricultural Course, third semester Science and Agriculture, and Veterinary. Includes the judging of different market classes of cattle, both beef and dual purpose, and sheep, both mutton and wool. Credit two hours, Two 2-hour judging periods per week. Fee, $2.00.

2. **Market Types of Dairy Cattle, Horses and Swine.** Second semester Agricultural Course, fourth semester Science and Agriculture, and Veterinary. Includes judging different market classes of dairy cattle, light and heavy horses, and swine, (bacon and fat). Two 2-hour judging periods per week. Fee, $2.00.

3. **Breed Types of Cattle and Sheep.** Third semester Agronomy, Dairy, and Animal Husbandry Courses, and fifth semester Veterinary. Includes judging representatives of different breeds according to their official standards, a study of their origin, history, characteristics, and adaptability to different conditions of climate and soil. Prerequisite, Animal Husbandry 1. Four hours credit. Lectures, two hours and two 2-hour judging periods per week. Fee, $2.00.

4. **Breed Types of Dairy Cattle, Horses and Swine.** Fourth semester Agronomy, Animal Husbandry, and Dairy courses, and sixth semester Veterinary. Includes judging of representatives of different breeds according to their official standards, a study of their origin, history, characteristics, and adaptability to different conditions of climate and soil. Prerequisite, Animal Husbandry 2. Four hours credit. Lectures, two hours and two 2-hour judging period per week. Fee, $2.00.

6. **Advanced Live Stock Judging.** Seventh semester Animal Husbandry. Includes judging horses, cattle, sheep and swine, especially in groups similar to county and state fair work. Prerequisites, Animal Husbandry 3 and 4, and Zoology 2 and 3. Two hours credit. Two 2-hour judging periods per week. Fee, $2.00.

7. **Herd Book Study.** Eighth semester Animal Husbandry and elective Agricultural Courses. Includes a study of herd books, with a view to becoming acquainted with the pedigrees of the leading strains and families of the different breeds of livestock. Prerequisites, Animal Husbandry 3 and 4. Recitations, two hours per week.

8. **Animal Breeding.** Sixth semester of the Animal Husbandry and Veterinary Courses. Embraces a study of principles of breeding, including selection, heredity, atavism, variation, fecundity, with the presentation of methods of breeding, in-and-in breeding, cross breeding, etc., and a historical study of their results, also the several features relating to the higher breeding of pure bred stock. Prerequisites, Animal Husbandry 3 and 4, and Zoology 5. Recitations, two hours per week.

9. **Animal Nutrition and Packing House By-Products.** Seventh semester Animal Husbandry, and elective Agricultural Courses. Study of anatomy and physiology of the digestive system, the purpose of nutri-

tion, the theory and practical economy of rations for growth, fattening, milk or maintenance; sanitation of feeds and hygiene of the farm. Prerequisites for Agricultural Courses, Chemistry 21, 23 and 25. Recitations, two hours per week.

10. **Thesis.** Eighth semester Animal Husbandry. Must be along some line to be arranged with the head of the department. Two hours credit.

11. **Feeding and Management of Live Stock.** Fifth semester Animal Husbandry, first semester Veterinary, and elective Agricultural Courses. The practical feeding, care and management of beef and dairy cattle. Two hours credit. Lecture, one hour, and laboratory, two per week. Fee, $2.00.

12. **Feeding and Management of Live Stock.** Sixth semester Animal Husbandry, second semester Veterinary, and elective Agricultural Courses. The practical feeding, care and management of horses, hogs and sheep. Prerequisite, Animal Husbandry 11. Two hours credit. Lecture, one hour, and laboratory, two hours, per week. Fee, $2,00.

13. **Advanced Work in Beef Production.** Eighth semester Animal Husbandry. A systematic study of the most successful and economical methods of producing beef cattle for market purposes; production of baby beef; advisability of long and short feeding periods; and the feeding of grain rations to cattle on grass. Prerequisites, Animal Husbandry 9, and Zoology 5 and 8. One hour credit. Five 1-hour periods per week for first five weeks.

14. **Advanced Work in Pork Production.** Eighth semester Animal Husbandry. A systematic study of most successful and economical methods of growing and finishing pigs of both the lard and bacon types for market purposes. Prerequisites, Animal Husbandry 9, and Zoology 5 and 8. One hour credit. Five 1-hour periods per week for second five weeks.

15. **Milk Production.** Eighth semester Animal Husbandry and Dairy. Study of various feeding stuffs and the methods of preparing and feeding same as related to most successful and economical production of milk. Prerequisite, Animal Husbandry 9. One hour credit. Five 1-hour periods during four weeks following Animal Husbandry 14.

16. **Advanced Work in Mutton and Wool Production.** Eighth semester Animal Husbandry. A thorough study of various feeding stuffs as related to economical production of mutton and wool. Prerequisites, Animal Husbandry 9, and Zoology 5 and 8. One hour credit. Five 1-hour periods per week following Animal Husbandry 15.

17. **Advanced Work in Horse Feeding.** Eighth semester Animal Husbandry. A study of most successful and economical methods of growing and developing young animals; most economical and satisfactory rations for horses at light, medium and heavy work; study of the feeding stuffs best adapted to the production of heavy and economical gains

on horses which are being fattened for market. Prerequisites, Animal Husbandry 9, and Zoology 5 and 8. One hour credit. Five 1-hour periods per week following Animal Husbandry 16.

18. Breeding and Judging Dairy Stock. Second semester One Year Dairy Course. Judging dairy stock with the score card and by comparative judging; also study of principles, methods and practice of breeding dairy stock and their improvement. Two hours credit. Lecture, one hour, and laboratory, one hour, per week.

19. Feeding Dairy Stock. First semester One Year Dairy Course. Principles of feeding animals for the most economical production, with the composition and use of various feeding materials, feeding of dairy cows, including the influence of various feeding stuffs on the quantity, quality and composition of milk, butter and cheese. Two lectures per week.

20. Animal Feeding. Fifth semester Veterinary, seventh semester Agronomy, Dairy, Agricultural Engineering, elective Agricultural Courses. A study of the composition and digestibility of feeding stuffs; the preparation of coarse fodders; the grinding, steaming and cooking of feeding stuffs; feeding standards and the calculation of rations; feeding for meat, milk, wool, growth and work. Prerequisites, Veterinary 4 and 24, and Chemistry 13. Two hours credit.

21. Principles of Breeding. Fifth semester Agronomy and Dairy Courses and elective Agricultural Courses. An elementary course in breeding offered to meet the demands of those students who have not sufficient foundation to take the regular course in Animal Breeding. Embraces a study of the general principles of breeding, selection, variation, heredity, atavism, etc., and a historical study of the results to date. Prerequisites, Animal Husbandry 1 and 2. Two hours credit.

22. Animal Husbandry Seminar. Fifth and sixth semesters Animal Husbandry Course. One hour credit.

23. Animal Husbandry Seminar. Seventh and eighth semesters Animal Husbandry Course. One hour credit.

The Animal Husbandry Seminar Courses 22 and 23 meet once each two weeks while college is in session, and has for its members the professors and instructors in Animal Husbandry, and all students in the Junior and Senior classes in the course in Animal Husbandry. At each meeting, four students—two Seniors and two Juniors—present papers on associated Animal Husbandry topics. These subjects are selected a half year in advance and follow, in regular series, Animal Breeding, Relation of Animal Husbandry to Other Industries, Animal Feeding, and a study of Live Stock Organizations, Expositions, College and Experiment Station Organization and Equipment.

POULTRY HUSBANDRY.

The Poultry Husbandry Department affords opportunities for instruction in all lines of poultry work, such as the selection, care and management, incubating, brooding, judging, breeding, feeding, showing, marketing, and diseases of various varieties of fowls, ducks, turkeys, and geese.

The Poultry Farm of nearly twenty acres upon which the buildings have been erected this year offers unexcelled opportunities for practical instruction.

INVESTIGATION AND THE REARING OF YOUNG STOCK.

The buildings consist of a large headquarters building, long poultry house and colony houses for brooders, young stock and breeding stock. The Headquarters Building contains a large feed room, carpenter shop, incubator room, killing and marketing room, egg room, and room for attendants; and is without doubt the best building of its kind in the country. The long poultry house, of the cloth curtain type, consists of seven 12x12 pens which, together with the colony houses, have a capacity of approximately one thousand head of poultry, which is used in laboratory and investigational work. All pens are equipped with trap nests so that individual egg records may be obtained from each hen. The Incubator room is equipped with machines made by several of the leading incubator firms and affords opportunity for a complete study of the different types of incubators. A thorough study of the latest brooding methods is also made.

POSITIONS OPEN TO MEN TRAINED ALONG POULTRY HUSBANDRY LINES.

At the present time there is an urgent and increasing demand for College men who possess scientific training in Poultry Husbandry together with practical experience and ability. Some of the openings for students trained along these lines are college and Experiment Station work, managers of utility and fancy poultry farms, poultry journalism and poultry judging, managers of poultry supply houses and poultry feed departments, superintendents and buyers for poultry fattening establishments, salesmen with the incubator and brooder manufacturers.

COURSES IN POULTRY HUSBANDRY.

30. Poultry Judging. Sixth semester Animal Husbandry Course, elective Agricultural Courses. This course includes a study of the origin, history, and classification of the various breeds and varieties, and the scoring, judging and breeding of the most important varieties, in accordance with the American Standard of Perfection. Practice will be given in the study of feather markings, judging and fitting of birds for show. Three hours credit. Lectures, two hours, and 1 two-hour laboratory period per week. Fee, $2.00.

31. Poultry Management. Fifth semester Animal Husbandry Course, elective Agricultural Courses. This course includes a study of poultry houses, arrangement of buildings and yards, feeds and feeding, judging for market types, incubation, brooding, anatomy of fowl and egg, diseases, sanitation, caponizing, killing, dressing and marketing of poultry products. Three hours credit. Lectures, two hours, and 1 two-hour laboratory period per week. Fee, $2.00.

32. **Practice in Feeding and Management.** Elective Agricultural Courses. The student will be given charge of a pen of fowls and will be required to keep a record of the amounts and cost of food consumed, gains made, eggs produced and calculate the profit or loss. This work will cover a period of three weeks, and the student must be present morning, noon and afternoon, time to be arranged by appointment with the instructor. Prerequisite, Course 30. One hour credit. Fee, $2.00.

33. **Incubator Practice.** Elective Agricultural Courses. Each student will be given charge of one or more incubators for the period of one hatch and required to keep records of fuel consumed, temperatures, infertile eggs, dead germs, dead in shell, chicks hatched, and reckon the cost of incubation. This course will cover a period of four weeks and the student must be present morning, noon and afternoon, time to be arranged by appointment with the instructor in charge. Prerequisite, Course 31. One hour credit. Fee, $2.00.

34. **Brooder Practice.** Elective Agricultural Courses. Each student will be given charge of chicks in a brooder for four weeks from time of hatching and must keep records of temperatures, fuel and foods consumed, gains made, mortality, and calculate the cost of brooding. The student will be required to be present morning, noon and afternoon, time to be arranged by appointment with instructor. Prerequisites, Courses 31 and 33. One hour credit. Fee, $2.00.

35 and 36. **Poultry Research and Experimentation.** Elective Senior year in all Agricultural Courses. This course is intended for those students who wish to fit themselves especially for college and experiment station work in Poultry Husbandry. This course will include a report of special research on some poultry topic, a study of the Poultry Husbandry work now being carried on in the experiment stations throughout the country, methods and technique of breeding from egg production and meat types, arrangement of experimental records and data in feeding, breeding, incubation and brooding. Students electing this course should also take their thesis in Poultry Husbandry. This course extends throughout the year. Time by appointment. Prerequisites, Courses 30 and 34. One hour credit each semester. Fee, $2.00.

37. **Advanced Poultry Management.** Sixth semester Animal Husbandry Course. This course includes advanced work in Poultry Management, containing the work started in Course 31. Three hours credit. Lecture, 2 hours, and one 2-hour laboratory period per week. Fee, $2.00.

ONE YEAR POULTRY HUSBANDRY COURSE.

This course is intended for those students who wish to prepare themselves for practical poultry work and have but one year to devote to study and practice. The course will consist of courses 30 to 34 inclusive, practical work on the Poultry Farm, and reports on especially assigned topics. The practical work will consist of five to eight hours work per day in the caring for poultry, building of colony houses, running of incubators and brooders, killing and dressing, mixing of feeds, and such other work as is ordinarily done on a poultry farm. This gives the student a chance to acquire that skill which comes only from practice.

GRADUATE WORK IN POULTRY HUSBANDRY.

Because of the newness and great scope of the field, Poultry Husbandry offers many opportunities for doing valuable research work. Unexcelled opportunities are offered for the common application of training the student may have received in embryology, bacteriology, physics, zoology, entomology, farm architecture, etc. Some of the lines along which the student may work are:

1. **Breeding.** Because of the shortness of generations and widely varying characteristics in color and shapes of varieties, poultry offers unexcelled opportunities for study of unit characters in crossing and the laws of heredity. Work may also be done along the lines of breeding for meat type and increased egg production.

2. **Feeding.** Comparative studies of different rations for laying and breeding stock, rearing and fattening or finishing. Comparison of breeds in regard to gains made on certain rations. Effect of feeding on color of feathers or composition of flesh and eggs.

3,. **Housing.** Comparison of glass front, curtain front or combination glass and curtain front houses. Comparison of large and small flocks. Study of colony houses, Poultry House Sanitation.

4. **Incubation.** This branch of the industry is in great need of investigation because of its vast importance and the little knowledge we now have of its laws. Such lines of work could be taken up as: Effect of moisture or non-moisture methods on the hatchability of eggs and vitality of chicks; value of carbon dioxide in incubation; study of natural methods; loss in weight in incubation; change in the structure and density of the shell; selection of chicks as they hatch for constitutional vitality; difference in incubation management for eggs of different classes of poultry.

5. **Brooding and Rearing.** Brooding in large versus small flocks; natural versus artificial brooding; study of brooder diseases; effects of temperature on health and growth of chicks.

6. **Poultry Diseases and Pests.** Study of cholera, sorehead, black head, roup and other poultry diseases with a view to prevention and cure. Study of lice, mites, rats and other pests with a view to their extermination.

7. **Comparative Anatomy.** To determine the comparative market values, distribution of edible meat, textures of flesh and different types of various breeds.

The many varieties of stock, buildings, incubators, brooders and other equipment on the poultry farm, together with birds shipped in from all parts of the state, are available for this work.

Graduate Work in Animal Husbandry.

Graduate work in Animal Husbandry may be taken along any of the following lines:

1. **Animal Nutrition.** Because of the large number of horses, cattle, sheep, and swine feeding experiments being conducted on the College Farm, the opportunities for doing research work in this line are unequalled.

2. **Animal Breeding.** Includes special work along new and original lines pertaining to principles underlying Animal Breeding.

3. **Study of Breeds.** With not only typical specimens, but also, in most cases, complete breeding herds of almost every recognized breed of live stock on the continent, the post graduate student is offered unexcelled opportunity for studying breeds adapted to Iowa conditions.

4. **Stock Judging.** For this work, all the various market types of animals and good representatives of pure breeds are available. These are carefully studied on foot, then slaughtered for a block test and the exact percentages and values of various cuts determined.

5. **Practical Management of Stock.** A study and investigation of methods employed on best managed stock farms and breeding establishments in the United States, Canada, Great Britain, and other countries, thus preparing students to manage stock farms.

DEPARTMENT OF HORTICULTURE AND FORESTRY

S. A. BEACH, PROFESSOR.
A. T. ERWIN, ASSOCIATE PROFESSOR, HORTICULTURE.
CHAS. A. SCOTT, ASSOCIATE PROFESSOR, FORESTRY.
LAURENZ GREENE, INSTRUCTOR.
O. J. B. SMITH, ASSISTANT.
F. W. MEYER, GARDENER.
GEORGE R. BLISS, EXTENSION WORK.

The department of Horticulture and Forestry with its orchards, plantations of small fruits and vegetables, forest garden, forest area, pomological and forestal museum, greenhouses, laboratories and library, affords excellent opportunities for instruction and research.

A large part of the library of the Department is kept in its offices in Agricultural Hall where it is available to students specializing in this line of work. Besides a fairly complete collection of publications pertaining to horticulture and forestry and files of numerous periodicals, it also includes the complete library of Charles Downing containing his original drawings and manuscripts and many rare and valuable works on horticulture and forestry.

About 100 acres of land are now available for horticultural and forestal purposes including a recently added tract of 60 acres which has not yet been developed. Besides this the campus of more than 100 acres affords opportunities for instruction concerning ornamental trees and plants and landscape design.

Orchards ranging in age from two years to twenty years contain representatives of the hardiest types of cultivated fruits both native and foreign and include over a thousand varieties. Several thousand seedling varieties which have been originated in the work in plant breeding are being tested in the orchards and nurseries. Various methods of stratification, layering, budding, grafting and other operations with plants are given practical illustration in the greenhouses and nurseries. Annual variety tests with leading types of vegetables afford opportunity for study along this line of work.

The past few years have witnessed a wonderful development in the science of Forestry due in large part to the increasing scarcity of timber so necessary in the development of every state and community. Large manufacturers and lumbermen are turning to practical forestry as a means of insuring the permanency of their industries. This is causing an increasing demand for trained men to manage our existing forests, provide for future crops, and reclaim barren non-agricultural lands by tree planting. The Government Forest Service calls for a number of college graduates each year and trains them in scientific forestry work. To meet these numerous demands for men, several colleges and universities, including this one, are giving courses of instruction in Forestry.

The questions that are of greatest importance in the development of forestry in Iowa are the formation, care and harvesting of the farm grove and woodlot and the prevention of stream erosion by tree planting, hence special attention is paid to these problems. Although Iowa is classed as a prairie state, yet there are excellent opportunities for the practical study of forestry in many parts of the state. There are several planted groves and considerable timber upon and near the college campus.

The museum of the department contains a large collection of woods native to this country, tropical America and the Philippine Islands which afford the student ample opportunity for becoming acquainted with the structure and gross appearance of the principal commercial timbers on the markets of this country.

HORTICULTURE AND FORESTRY IN WINTER SHORT COURSE

(January 3, 1910, to January 15, 1910).

The Department of Horticulture and Forestry offers work during the winter short course which is designed especially to meet the needs of men who have not the opportunity to take a complete course. Instruction will be given in up-to-date methods of combating insects and diseases of the orchard and garden and in the operation of various kinds of spraying apparatus from hand pumps to gasoline power machines. Other subjects which will be studied are the harvesting and storage of apples, especially the handling of apples in cold storage; varieties best adapted to the various sections of the state both for home use and commercial planting; pruning and other practical topics pertaining to orchard management; propagation of plants including grafting, layering, budding and the growing of cuttings; management of farm woodlots and planted groves; most profitable trees to plant; treatment of posts to prevent decay; and the laying out and ornamental planting of home grounds.

The College campus affords excellent opportunity for studying the different varieties of deciduous trees, evergreens, and other ornamentals. Leading varieties of orchard fruits and potatoes from different sections of the state will be supplied for exhibition and laboratory use.

COURSE IN HORTICULTURE AND FORESTRY

For Freshman year, see Agricultural Course, page 65.

Sophomore Year.

THIRD SEMESTER.

		Required semester hours
Horticulture 1,	Vegetable and Greenhouse Crops	3
Horticulture 19,	Silviculture	1
Agricultural Engineering 4,	Farm Engineering	4
Soils 1,	Soil Physics	4
Agricultural Chemistry 21,	Elementary Experimental Chemistry	5
Economic Science 9,	Outlines of Economics	3
Military 3, or Athletics,		
	Total semester hours	20

FOURTH SEMESTER.

		Required semester hours
Horticulture 7,	Pomology	2
Horticulture 15,	Advanced Silviculture	1
Agricultural Engineering 8,	Spraying Apparatus	1
Zoology 16,	General Zoology	5
Agricultural Chemistry 23,	Elementary Experimental Chemistry	5
English 12,	Argumentation	2

Choice	Economic Science 10,	Agricultural Economics	3	3
	History 6,	French Revolution and XIXth Century	3	
	Military 4, or Athletics,			—
		Total semester hours		20

Junior Year.

FIFTH SEMESTER.

			Required semester hours		
Choice	Horticulture 5,	Advanced Pomology	3	3 or	6
	Horticulture 18, and	Forest Utilization	2		
	Civil Engineering 508,	Surveying	4		
	Soils 13,	Soil Surveying		2	2
	Zoology 4,	Entomology		4	4
	Agricultural Chemistry 25,	Agricultural Chemistry		4	4
				—	—
				13	16
	Elective: The student will select from the list of electives on page 122 enough work to make a total of from sixteen to twenty hours per week			3 to	7
				—	—
		Total semester hours		16 to	20

SIXTH SEMESTER.

			Required semester hours		
Choice	Horticulture 10,	American Horticulture	2	2 or	6
	Horticulture 16, and	Forest Development and Policy	2		
	Civil Engineering 609,	Surveying	4		
	Botany 11,	Vegetable Physiology		4	4
	Botany 15,	Systematic Botany		3	3
	Soils 2,	Soil Fertility		4	4
				—	—
				13	17
	Elective: The student will select from the list of electives on page 122 enough work to make a total of from sixteen to twenty			3 to	7
				—	—
		Total semester hours		16 to	20

Senior Year.

SEVENTH SEMESTER.

		Required semester hours	
Horticulture 8,	Landscape Gardening	3	3
Horticulture 9,	Research Work	2	2
Botany 5,	Vegetable Pathology	3	5
Geology 10,	General Geology	4	4
		12	14
Elective: The student will select from the list of electives on page 122 enough work to make a total of from sixteen to twenty hours per week		4 to 8	
	Total semester hours	16 to 20	

EIGHTH SEMESTER.

			Required semester hours	
Choice	Botany 24, and Horticulture 4,	Plant Embryogeny	1	
		Plant Breeding	3	
	Horticulture 17,	Wood Technology		3
	Horticulture 13,	Thesis	2	2
	Botany 30,	General Bacteriology	4	4
			10	9
Elective:	The student will select from the list of electives on page 122 enough work to make a total of from sixteen to twenty hours per week		6 to 10	
		Total semester hours	16 to 20	

COURSES IN HORTICULTURE

1. **Vegetable and Greenhouse Crops.** Third semester, Horticultural Course, and elective Agricultural Courses. The general culture of vegetables in the field and under glass and also other commercial crops grown under glass. Three hours credit. Two lectures and one laboratory.

2. **Plant Propagation.** Second semester Agricultural Course, Fourth semester Science and Agriculture. Propagation of plants by sexual and non-sexual methods; germination, testing and storage of seeds, multiplication of plants by cuttage, layerage and graftage, including both greenhouse and nuresry types. Three hours credit. Recitations, two hours, and laboratory, two hours, per week. Fee, $1.00.

3. **Orcharding.** Third semester, Animal Husbandry, Agronomy, Dairy and Science and Agriculture. The establishment and care of home orchards and vineyards; systematic study of varieties adapted for planting in Iowa. Three hours credit. Recitations, two hours, and laboratory, two hours, per week. Fee, $1.00.

4. **Plant Breeding.** Eighth semester Horticulture, except Forestry students, Agronomy, and Science and Agriculture, elective Agricultural Courses. Study of the principles of plant breeding and their application to the improvement of plants. Horticulture 2, Botany 11, and Botany 24, prerequisite or required with this course. Recitations, three hours per week.

5. **Advanced Pomology.** Fifth semester Horticulture, elective Agricultural Courses. Commercial orcharding; grading, storing, and marketing fruit; fruit judging; orchard and nursery technique. Prerequisite, Horticulture 2 and 7. Three hours credit. Recitation, one hour, and laboratory, two hours, per week. Fee, $1.00.

7. **Pomology.** Fourth semester Horticultural Course, and elective Agricultural Courses. A study of the problems involved in the establishment and care of orchards; orchard technique; spraying; tillage and soil management. Prerequisites, Horticulture 2 and Agricultural Chemistry 21. Two hours credit. Two lectures and one laboratory. Fee, $1.00.

8. **Landscape Gardening.** Seventh semester Horticulture and Agricultural Engineering, elective Agricultural courses, and Science courses. A study of the principles involved in the planting and decoration of home grounds and parks; ornamentals adapted to planting in Iowa. The ornamental trees and shrubs on the campus and in the department afford excellent material for laboratory work. Three hours credit. One recitation, and four laboratory hours per week.

9. **Research Work.** Seventh semester Horticulture, elective Agricultural Courses. An independent investigation in some line of work under the supervision of the head of the department. Two hours credit. Two hours per week.

10. **Development of American Horticulture.** Sixth semester Horticultural Course, of those students who do not elect the Forestry work, and elective Agricultural Courses. Study of the development of Horticulture in America, including the history of our cultivated fruits, the important workers in this field and the literature pertaining to the same. Two hours credit. Two hours per week.

11. **Floriculture.** Fifth semester Domestic Economy, and elective General Science. No course prerequisite. Propagation and general management of house plants and ornamentals for the home grounds. Recitations, two hours per week.

13. **Thesis.** Eighth semester Horticulture. The subject chosen must be one requiring independent investigation, the results of which are to be presented in a carefully written report. May be a continuation of Course 9. Two hours credit.

COURSES IN FORESTRY

Horticulture. 14.—Farm Forestry. First semester Agricultural Courses. The life history of trees and the relation of trees to their environment; their relation to each other in the forest; their requirements for light, heat, moisture. Attention is given to the study of the influence of forests in the modification of climatic conditions with special reference to the effects of windbreaks in agricultural districts. The establishment of windbreaks, shelterbelts, and farm woodlots in Iowa. The species best suited for such planting, the kind of stock to plant and the cost of planting. The rejuvenation of natural woodlots; the preservative treatment of farm timber supplies. The classification and identification of the conifers.

This course is designed to treat in a general way the forest problems that confront the Iowa farmers. Text, Principles of American Forestry, Green. Three hours credit. Recitations, two hours, and field work, supplemented by lectures, two hours, per week.

Horticulture 15.—Advanced Silviculture. Fourth semester Horticulture and Forestry, Science and Agriculture, elective Agricultural Courses.

This course is a continuation of Horticulture 19, and includes a study of the distribution and character of our native forests; the classification of the native hardwood species by twig and bud characteristics; methods of natural reproduction, artificial regeneration; planting seeds, care of the nursery, transplanting and planting out seedlings, treatment of woodlands; pruning, thinning, improvement cutting, and underplanting. A study of forest types and silvicultural systems suitable for given forest conditions. Two hours credit. One lecture, and two hours field work.

Horticulture 16.—Forest Development and Policy. Sixth semester Horticulture and Forestry, elective Agricultural Courses. Attitude of nations toward forestry; development of forestry in the United States; relation of forestry to national reclamation work; protection of forests against natural enemies. Two hours credit.

Horticulture 17.—Wood Technology. Eighth semester Forestry students, elective Agricultural Courses. A study of common woods, their uses, and identification by structural characteristics; methods and effects of drying; methods and effects of preservative treatment. Two hours credit. One hour recitation and two hours laboratory.

Horticulture 18. Forest Utilization. Fifth semester of students specializing in Forestry, elective Agricultural Courses. Study of economic relations of timber to manufacturing industries; conversion of timber into finished products; consumption of timber products; grading of lumber. Prerequisite, Horticulture 15. Two hours credit. One lecture and two hours field work.

Horticulture 19.—Silviculture. Third semester Horticulture and Forestry, and Science and Agriculture, elective Agricultural Courses.

The work of this course includes the gathering and storing of forest tree seeds; mulching and heeling in of nursery stock. A study of windbreaks, groves and natural woodlots to determine their rate of growth; and the merchantable contents of single trees and whole forests. This course is introductory to Horticulture 15. One hour credit. Two hours field work per week.

Horticulture 20.—Timber Physics. Eighth semester Agricultural Engineering Course, elective Engineering Courses. A study of woods, their uses and identification by structural characteristics. Methods and effects of drying timbers; methods and effects of preservative treatment of timbers. The identification of native and planted trees. Two hours credit. Laboratory and field work in identification of species two hours per week. Laboratory and field work supplemented by lectures during the periods.

GRADUATE WORK IN HORTICULTURE AND FORESTRY.

Advanced work in Horticulture along the lines indicated in the under-graduate courses is open to properly qualified students. Special facilities are offered for the study of problems bearing upon pomology, the breeding and propagation of plants and the storage of fruits.

In Forestry, opportunity is offered for special investigation of tree planting under prairie conditions, including the prevention of erosion and the reclamation of flood damaged lands by tree planting.

Department of Agricultural Engineering

J. B. DAVIDSON. PROFESSOR.
E. W. HAMILTON, INSTRUCTOR.
R. E. CARR, ASSISTANT.
D. W. SYLVESTER, ASSISTANT.
A. O. ALEXANDER, ASSISTANT.

The development of modern agricultural machinery, the increase in the size and importance of farm structures, the improvement of land by drainage and its reclamation by irrigation and the need of better roads, demand that the successful farmer of today must be trained along mechanical and engineering lines. To supply this training and to investigate problems related thereto is the work of the Department of Agricultural Engineering.

It is believed that the Department of Agricultural Engineering at the Iowa State College has the most complete equipment of any similar department in existence. It is at present housed in Agricultural Engineering Hall, a fire proof building to the rear of Agricultural Hall. Upon the completion of New Agricultural Hall additional room in the older building will be provided the department.

Some of the features of the equipment are as follows: The laboratories contain over twenty thousand dollars worth of farm machinery.

Surveying instruments are provided sufficient to equip fourteen field parties. The Forge shop is equipped with twenty Buffalo down draft forges and individual tool sets together with a complete set of special tools, a press drill and grinder. The carpenter shop has benches and tool sets for thirty students and a miscellaneous tool equipment is provided in the tool room. This shop is also provided with a power cross cut and rip saw, a planer and two speed lathes.

The work of the Department is carried on in conjunction with the Agricultural Engineering Section of the Agricultural Experiment Station. An experimentalist devotes his entire time to research and is provided with a separate laboratory. This laboratory has many special instruments in the way of dynamometers, indicators, and testing machines, and also a tool equipment including a fourteen-inch engine lathe.

NEW COURSE IN AGRICULTURAL ENGINEERING

The work of the Department is principally that of giving instruction to those who intend to make the farm the object of their life work; however, the demand for instructors and others trained along these lines requires the department to offer special instruction to meet this demand.

Following is a course in Agricultural Engineering which is offered for the first time. This course is designed to be especially strong along the fundamental sciences upon which Agricultural Engineering depends.

Positions Open for Men Trained Along Agricultural Engineering Lines.

The course in Agricultural Engineering is designed to fit graduates for the following lines of work:

1. Managers and superintendents of farms where drainage, irrigation and the use of agricultural machinery is a large factor in the management.
2. Teachers and instructors of Agricultural Engineering in agricultural colleges.
3. Teachers of practical mechanics in Agricultural High Schools.
4. Government experts in Agricultural Engineering.
5. Professional work in drainage and highway engineering.
6. Positions in the farm machinery industry requiring mechanical skill and a knowledge of the science of agriculture.

Attention is invited to the provision of page 30 in this catalog for securing the degree of B. S. in A. E. by those who have completed a four year engineering course, upon completion of one additional year of prescribed work.

COURSE IN AGRICULTURAL ENGINEERING

For Academic year, see Agricultural Course, page 65.

Freshman Year.

FIRST SEMESTER.

		Required semester hours
Agricultural Engineering 1 or 2	Shop Work	2
Animal Husbandry 1	Market Types of Cattle and Sheep	2
Farm Crops 1	Corn Growing and Judging	3
Horticulture 14	Farm Forestry	3
English 10	Narration and Description	3
Mathematics 20	Algebra	4
Mathematics 21	Plane Trigonometry	1
Mechanical Engineering 181	Mechanical Drawing	1
History 17	The American People	1
Military 1	Military	
Library	Library Instruction	
		20

SECOND SEMESTER.

		Required semester hours
Agricultural Engineering 1 or 2	Shop Work	2
Animal Husbandry 2	Market Types of Dairy Cattle, Horses and Swine	2
Dairying 12	Farm Dairying	3
Farm Crops 2	Grains, Grasses and Forage Crops	3
English 11	Exposition	3
Mathematics 22	Trigonometry	2
Mathematics 23	Analytical Geometry	3
Military 2	Military Drill	
Mechanical Engineering 220	Descriptive Geometry	2
		20

Sophomore Year.

THIRD SEMESTER.

		Required semester hours
Agricultural Engineering 4	Farm Engineering	4
Mathematics 24	Analytical Geometry	2
Mathematics 25	Calculus	3
Physics 303	Mechanics and Heat	5
Mechanical Engineering 322	Mechanical Drawing	1

Chemistry 21	Agricultural Chemistry	5
Military or Athletics		
		20

FOURTH SEMESTER.

		Required semester hours
Agricultural Engineering 5	Farm Machinery and Farm Motors	3
Chemistry 23	Elementary Experimental Chemistry	5
Physics 404	Electricity and Magnetism and Light and Sound	5
Mathematics 26	Differential and Integral Calculus	4
Mechanical Engineering 401	Analytical Mechanics	3
Military or Athletics		
		20

Junior Year.

FIFTH SEMESTER.

		Required semester hours
Agricultural Engineering 3	Farm Blacksmithing and Horseshoeing	2
Agricultural Engineering 7	Dairy Engineering	2
Soils 1	Soil Physics	4
Mechanical Engineering 502	Analytical Mechanics	5
Mechanical Engineering 512	Engineering Laboratory	1
Economic Science 9	Outlines of Economics	3
Civil Engineering 345	Surveying	2
		19

SIXTH SEMESTER.

		Required semester hours
Agricultural Engineering 6	Rural Architecture	3
Agricultural Engineering 9	Research work in Agricultural Engineering	3
Soils 2	Soil Fertility	4
Mechanical Engineering 606	Analytical Mechanics	5
Mechanical Engineering 613	Engineering Laboratory	1
Civil Engineering 653	Materials of Construction	2
Civil Engineering 446	Surveying	2
		20

Senior Year.

SEVENTH SEMESTER.

		Required semester hours
Agricultural Engineering 10	Research in Agricultural Engineering	3
Farm Crops 8	Farm Management	3
Horticulture 8	Landscape Gardening	3
Veterinary 44	Sanitary Science	2
Mechanical Engineering 714	Laboratory	1
English 12	Argumentation	2
Animal Husbandry 20	Animal Feeding	2
Elective		2
		18

EIGHTH SEMESTER.

		Required semester hours	
Agricultural Engineering 11 or 12		3 or	5
Mechanical Engineering 533	Shop work	2	2
Horticulture 20	Timber Physics	2	2
History 18	The American Statesman	1	1
		8	10
Elective		8 or	10
		16	18

COURSES IN AGRICULTURAL ENGINEERING.

1. **Shop Work.** First or second semester Agricultural Courses. Blacksmithing, forging and welding of iron and steel, and making and tempering hand-tools. Work designed to be especially helpful in the repair and operation of machinery. Two hours credit. Four hours per week. Fee, $2.50.

2. **Shop Work.** First or second semester Agricultural Courses. Carpentry, care, use and sharpening of tools, laying off work, making of joints and framing. Work designed to be especially helpful in the planning, framing, and construction of farm buildings. Two hours credit. Four hours per week. Fee, $2.50.

3. **Farm Blacksmithing and Horse Shoeing.** Fifth semester Agricultural Engineering and elective Agricultural Courses. An advanced course in blacksmithing. Two hours credit. Laboratory, four hours per week. Fee, $2.50.

4. **Farm Engineering.** Third semester Agronomy, Animal Hus-

bandry, Horticulture, Agricultural Engineering and elective Dairying, and Science and Agriculture Courses. Includes instruction in Agricultural Surveying, also a study of location of drainage districts, drainage laws, and best systems of drainage; location and construction of roads; the building of fences and concrete construction in farm work; also drawing, including lettering, map making, planning of drainage systems and road profiles; and field work, including care, adjustment and practice in the use of surveying instruments. Prerequisite, Mathematics 17. Four hours credit. Recitation, two hours, and laboratory, four hours, per week. Fee, $2.00.

5. **Farm Machinery and Farm Motors.** Fourth semester Agronomy, Animal Husbandry and Agricultural Engineering and elective Agricultural Courses. Includes a brief study of mechanics and materials; a study of the development, construction, functions and methods of operating, adjusting and repairing implements and machinery; also the study of the principles of draft and the production of power. Laboratory work devoted to the comparative analysis and testing the machines discussed in the class room. Three hours credit. Recitations, two hours, and laboratory, two hours. Fee, $2.00.

6. **Rural Architecture.** Sixth semester Agricultural Engineering and elective Agricultural Courses. Embraces the planning of all farm buildings, a study of their construction, lighting, ventilation, cost, convenience, also testing the strength of building materials, and making of plans and specifications. Prerequisite, Agricultural Engineering 4. Three hours credit. Recitation, one hour, and laboratory, four hours, per week.

7. **Dairy Engineering.** Third semester Dairying, fifth semester Agricultural Engineering, and first semester One Year Dairy Course, elective Agricultural Courses. Special work in the management, care and operation of steam and gasoline engines. Two hours credit. Recitation, one hour, and laboratory, two hours, per week. Fee, $2.00.

8. **Spraying Apparatus.** Fourth semester Horticulture. Elective Agricultural Courses. Precedes Field Practice in Horticulture 7 in the same semester. A brief study of the mechanics of pumps, also the care, operation and repair of spraying apparatus. One hour credit. Recitation, one hour, and laboratory, two hours, per week for one-half semester. Fee, $1.00.

9. **Research Work in Agricultural Engineering.** Sixth semester Agricultural Engineering and Agronomy by all students who do not elect research work in Soils or Farm Crops, and elective in Agricultural Courses. The large equipment of machinery and instruments in this department offers to the student a wide range of subjects for research work, as Drainage, Farm Water Supply, Sewerage, Road Construction, Fences, Use of Cement on the Farm, Testing and Calibrating various Farm Machines and Traction Tests. Prerequisites, Agricultural Engineering 4 and 5. Three hours credit. Fee, $2.00.

10. Research Work in Agricultural Engineering. Seventh semester Agricultural Engineering and Agronomy by all students who do not elect research work in Soils or Farm Crops. Work same as in 9. Prerequisites, Agricultural Engineering 4 and 5. Three hours credit. Fee, $2.00.

11. Thesis. Eighth semester Agricultural Engineering and Agronomy. Must be upon some subject requiring original work taken in Farm Crops, Agricultural Engineering or Soils. Three hours credit.

12. Thesis. Same as Agricultural Engineering 11, except five hours credit.

13. Gas and Oil Engines. May be substituted for Agricultural Engineering 9 and 10 in the Agricultural Engineering Course, elective Agricultural Engineering and Science.

A comprehensive course in the practical operation and management of the internal combustion engine. The course includes a study of the development, the existing types, the theory and practice of operation, the adjustment, the repair and the utility of gas, gasoline, oil, and alcohol engines. The laboratory work will consist of well arranged tests and exercises to familiarize the student with the practical care and management of this type of motor. One recitation and one laboratory period per week. Two hours credit. Fee, $1.50.

Graduate Work in Agricultural Engineering.

Students may take up graduate work along any of the many lines of Agricultural Engineering. This training will prepare them for government positions in agricultural engineering lines, for teaching in agricultural colleges, or for becoming managers or superintendents of farms. Investigation may be carried on along any special line which they are fitted to pursue. The following subjects are suggested: (A) Irrigation, studying the principles employed and the machinery used and its efficiency, also practical work in sewage irrigation on the College Farm; (B) Farm Architecture, the locating, designing, constructing, drawing up specifications and contracts, and estimating cost of all farm buildings; (C) Road Construction, thus fitting students for becoming highway engineers; (D) Investigation of Farm Implements, their construction and efficiency, also comparison of different makes. The department, having an equipment of $20,000.00 worth of modern implements, offers splendid opportunities for this line of investigation; (E) Farm Motors, the efficiency of steam traction and gasoline engines, also a comparison with the horse as power; and (F) Drainage, thus fitting students as drainage engineers. The co-operative experiments of this department with the United States Department of Irrigation and Drainage Investigation, furnish a good opportunity for study along this line.

SCIENCE AND AGRICULTURE.

The field of Agriculture presents such rapid changes and there is such wide and varied demand for young men combining agricultural and scientific training that it has been deemed advisable to offer a course less technical than the other agricultural courses that relates directly to some special line.

The course in Science and Agriculture is designed to meet the demands of country agricultural high schools and other institutions, public and private, established for the purpose of giving instruction in the general sciences and elementary instruction in agriculture. There will doubtless arise a large demand for strong, broadly educated, well trained teachers for this and other kinds of agricultural instruction in public and preparatory schools where the work is now being introduced.

A new phase of agricultural education has developed in recent years in the various forms of agricultural extension work. This movement is destined to be far reaching in its results and it is clearly one of the most potent influences in the field of agriculture. This phase of agricultural instruction, which is bringing science to the aid of agriculture by reaching the man in the field and on the farm, the children in the public school and the family in the home, is calling for well trained men far in excess of the supply.

COURSE IN SCIENCE AND AGRICULTURE.

For the Academic year, see Agricultural Course, page 65.

Freshman Year.

FIRST SEMESTER.

		Required Semester Hours
Farm Crops 1	Corn Growing and Judging	3
English 10	Narration and Description	3
Mathematics 17	Algebra and Trigonometry	3
History 19	The Making of the Nation, 1783-1817	2
Botany 30	Bacteriology	4
Agricultural Chemistry 21	Elementary Experimental Chemistry	5
Military 1		
		20

SECOND SEMESTER.

		Required Semester Hours
Farm Crops 2	Grains, Grasses and Forage Crops	3

English 11	Exposition	3
Physics 205	Mechanics, Heat and Light	3
Agricultural Chemistry 23	Elementary Experimental Chemistry	5
Zoology 16	General Zoology	5
Military 2		
		19

Sophomore Year.

THIRD SEMESTER.

		Required Semester Hours
Animal Husbandry 1	Market Types of Cattle and Sheep	2
Horticulture 19	Silviculture	1
Horticulture 3	Orcharding	3
Zoology 4	Entomology	4
Agricultural Chemistry 25	Elementary Experimental Chemistry	4
Economic Science 9	Outlines of Economics	3
English 12	Argumentation	2
Military 3, or Athletics		
		19

FOURTH SEMESTER.

		Required Semester Hours
Animal Husbandry 2	Market Types of Dairy Cattle, Horses and Swine	2
Farm Crops 4	Grain Breeding and Judging	2
Horticulture 2	Plant Propagation	3
Horticulture 15	Advanced Silviculture	2
Botany 15	Systematic Botany	3
Agricultural Chemistry 26	Elementary Experimental Chemistry	4
History 4	Division and Reunion	3
Military 4, or Athletics		
		19

Junior Year.

FIFTH SEMESTER.

At the beginning of the Junior year one of the two optional groups of studies listed for the Senior College must be selected. Students who elect an Optional Group will be required to carry the studies of that group as listed or arranged for the Junior and Senior years.

			Required Semester Hours
Required:			
Soils 1		Soil Physics	4
Literature 4		American Literature	3
			—
			7
Optional:			
Group I:	History 20	History of Education	2
	Psychology 1	General Psychology	5
			—
			7

The studies listed under Optional Group I, throughout the Junior and Senior years, except Civics 6, are required to secure without examination a five-year State Teacher's Certificate upon graduation. Those who do not take these subjects will be entitled to a two-year's State Teacher's Certificate upon graduation but will be required to pass an examination upon them within two years to have the certificate renewed.

Group II: The student shall select from one of the agricultural courses, with the approval of the Dean of Agriculture and the Head of the Department concerned, a major line or a major and a supporting line of study of not less than 7 hours per week during any one semester. The total number of hours of the major line, however, shall not be less than twenty hours for the two years.

Elective:

The student, with the approval of the Dean of Agriculture, will select from the list of electives on page 122, enough work to make a total of from sixteen to twenty hours per week.

SIXTH SEMESTER.

			Required Semester Hours
Required:			
Botany 11		Vegetable Physiology	4
Soils 2		Soil Fertility	4
			—
			8
Optional:			
Group I:	Civics 6	Actual Government	3
	History 21	History of Education	2
			—
			5

See statement for Optional Group I, first semester, Junior Year.

Group II: See statement for Group II, first semester, Junior Year.

Elective:

The student, with the approval of the Dean of Agriculture, will select from the list of electives on page 122, enough work to make a total of from sixteen to twenty hours per week.

Senior Year.

FIRST SEMESTER.

			Required Semester Hours
Required:			
Botany 5		Vegetable Pathology	3
Geology 10		General Geology	4
			—
			7
Optional:			
Group I:	Psychology 5	Principles of Education	3
	Civics 11	Methods of Teaching	2
			—
			5

See statement for Optional Group I, first semester, Junior Year.

Group II: See statement for Group II, first semester, Junior Year.

Elective:

The student, with the approval of the Dean of Agriculture, will select from the list of electives on page 122, enough work to make a total of from sixteen to twenty hours per week.

SECOND SEMESTER.

			Required Semester Hours
Required:			
Botany 24		Plant Embryogeny	1
Horticulture 4		Plant Breeding	4
			—
			5
Optional:			
Group I:	Psychology 6	Principles of Education	3
	Civics 12	Methods of Teaching	2
			—
			5

See statement for Optional Group I, first semester, Junior Year.

Group II: See statement for Group II, first semester, Junior Year.

Elective:

The student, with the approval of the Dean of Agriculture, will select from the list of electives on page 122, enough work to make a total of from sixteen to twenty hours per week.

DEPARTMENT OF AGRICULTURAL JOURNALISM.

C. V. GREGORY, INSTRUCTOR.

Four years ago a chair in Agricultural Journalism was established at the Iowa State College by the aid of Mr. John Clay, of the firm of Clay, Robinson & Co., of Chicago. This was distinctly a new departure in the field of agricultural education. By many agricultural journalism was looked upon as a field of labor of peculiar limitations, a field in which excellence could be obtained by heredity, but not by training or study. Mr. Clay, who is himself a most forcible writer, combining to a remarkable degree a wide range of practical information and a fascinating style, believed that training would count for something in this, as in all other lines of agricultural work. His address on "The Plow and the Book," delivered at Ames at the inception of this movement, has attracted wide attention.

The work, though started in a moderate way, has led to highly gratifying results. It has proven popular with the agricultural students, who have learned that there is great benefit to be derived from the study of this important subject. The graduates who have taken this work at Ames have given good account of themselves. A student who graduated two years ago immediately took a position on one of the leading agricultural papers. At the end of his first year's service his employer was pleased to contract with him for three years' service at a salary of $2500 for the third year. A student who graduated a year ago accepted a similar position on another paper and within a short time was advanced to an important editorial position on another paper of wide influence. One of the graduates in the class of '08 was given an immediate position as associate editor on one of the leading western farm weeklies. A student in the '09 class left school to accept a very attractive position as associate editor on one of the best farm papers in the east.

Not all students are qualified for editorial work, but all may be helped and strengthened by a good course in agricultural journalism, whether they intend to follow this calling or not. The ability to prepare a concise, readable article for publication is invaluable to the agricultural college graduate, no matter what line of work he intends to take up.

A man who has employed a number of Ames men for special work along this line said he had never yet been disappointed in one of them. An editor of a prominent agricultural paper, after passing on the work of one of the classes, said: "I don't think I need hesitate to say that I never got hold of nine articles that showed more uniform excellence, more care in preparation and observance of instruction received in the classroom."

In the *Live Stock World* reporting contest at the 1906 International, Ames men won three out of four first prizes and one-half of the money offered. In the National Corn show contest in 1907, Ames students won thirty-five out of sixty prizes and 68 per cent of the money offered, in competition with one hundred and fifty contestants from nine states. In the Iowa Corn Growers contest in 1908, Ames students won first, second, and third prizes and all of the money offered. All of these contests were based upon writing on practical subjects, with practical men as judges.

The work in agricultural journalism is proving that this subject has a place in the curriculum of a modern, well-equipped agricultural college, and in the education of the future farmer. The work not only stimulates a study of the essentials of agricultural journalism, but it admirably supplements a student's training in English, in clear concise expression, and his knowledge of general agricultural topics.

1. **Agricultural Journalism.** Elective first semester agricultural courses. Includes a study of "The Growth of Journalism," "The Place of Agricultural Journalism," "The Power of the Agricultural Press," "Preparing and Offering Articles," "The Importance of Brevity," "Style," "A Study of the Agricultural Press," "Reporting Conventions and Speeches," "Reporting Stock Shows," and other closely allied topics. Articles are assigned to the students twice each month. These are corrected and criticised from the standpoint of the editorial staff to which the student desires to submit the article. The aim of the course is to develop a clear, concise style of writing. The best manuscripts are sent to the leading agricultural papers of America and are often accepted and published. One hour credit.

2. **Agricultural Journalism.** Elective second semester agricultural courses. Lectures on "Individuality in Writing," "Feature Articles," "Writing for Special Issues," "The Mechanical Side of Newspaper Making," "Reviewing Books, Bulletins, and Exchanges," "Editing MS," "Proof Reading," "Writing Editorials," "Make-up," and "The Country Newspaper." Lectures are also given on "Photography, its Principles and Application to Journalism," by Mr. F. E. Colburn, who has had extensive experience in this work. Mr. C. A. Shamel of Chicago has inaugurated a trophy competition whereby the members of the class shall write articles on agricultural topics at the close of the course. The name of the winner is inscribed on the trophy, which becomes his property for a year. Members of this class do special work for many of the best farm papers during this term. Editors and managers of the leading agricultural journals lecture before the students. These talks are invaluable in establishing the students' viewpoint in this profession. Prerequisite, Agricultural Journalism 1. One hour credit.

SUMMARY OF AGRICULTURAL COURSES.

NOTE—(The number before the parenthesis indicates the course number; the number in the parenthesis indicates the number of hours credit.)

AGRONOMY COURSE.

NOTE—(The numbers after the hyphens indicate courses required of students taking one of the three special lines.)

	HOURS CREDIT		
	Farm Crops Special Line	Soils Special Line	Agricultural Engineering Special Line
Agricultural Chemistry 21 (5), 23 (5), 25 (4)	14	14	14
Agricultural Engineering 1 (2), 2 (2), 4 (4), 5 (3), - 9 (3), 10 (3), 11 (3)	11	11	20
Animal Husbandry 1 (2), 2 (2), 3 (4), 4 (4), 20 (2), 21 (2)	16	16	16
Botany 5 (3), 30 (4), - 11 (4), 24 (1)	12	12	7
Dairying 12 (3)	3	3	3
Economic Science 9 (3)	3	3	3
English 10 (3), 11 (3), 12 (2)	8	8	8
Farm Crops 1(3), 2 (3), 3 (2), 4 (2), 8 (3), - 9 (3), 10 (3), 15 (3)	22	13	13
History 19 (2)	2	2	2
Horticulture 14 (3), 2 (3), 3 (3), - 4 (3)	12	12	9
Library 1	R	R	R
Mathematics 17 (3), - 8 (5), 9 (5)	3	3	13
Military 1, 2, 3 or Athletics, 4 or Athletics	R	R	R
Physics 205 (3), - 404 (5)	3	3	8
Soils 1 (4), 2 (4), 8 (3), - 3 (3), 4 (3), 11 (3)	11	20	11
Veterinary 56 (1)	1	1	1
Zoology 16 (5), - 4 (4)	9	9	5
Electives (see page 122), (1), (9), - (2)	12	12	10
Totals	142	142	143

DAIRYING COURSE

	Hours Credit
gricultural Chemistry 21 (5), 23 (5), 25 (4), 26 (4), 40 (4)	22
gricultural Engineering 1 (2), 2 (2), 7 (2)	6
nimal Husbandry 1 (2), 2 (2), 3 (4), 4 (4), 15 (1), 21 (2), 20 (2)	17
otany 30 (4)	4
airying 11 (4), 12 (3), 13 (2), 14 (4), 16 (1), 17 (4), 18 (1), 19 (2), 20 (4), 21 (2), 23 (2), 24 (3)	32
conomic Science 9 (3)	3
nglish 10 (3), 11 (3), 12 (2)	8
arm Crops 1 (3), 2 (3)	6
istory 19 (2)	2
orticulture 2 (3), 3 (3), 14 (3)	9
ibrary 1	R
athematics 17 (3)	3
ilitary 1, 2, 3 or Athletics, 4 or Athletics	R
hysics 205 (3)	3
eterinary 44 (2), 56 (1)	3
lectives (6), (4), (1), (7)	18
conomics 10 or History 6 (3 hrs.)	3
Total	139

ANIMAL HUSBANDRY COURSE

gricultural Chemistry 21 (5), 23 (5), 25 (4), 26 (4)	18
gricultural Engineering 1 (2), 2 (2), 4 (4), 5 (3)	11
nimal Husbandry 1 (2), 2 (2), 3 (4), 4 (4), 6 (2), 7 (2), 8 (2), 9 (2), 10 (2), 11 (2), 12 (2), 13 (1), 14 (1), 15 (1), 16 (1), 17 (1), 22 (1), 23 (1), 30 (3), 31 (3).	39
otany 26 (2)	2
airying 12 (3)	3
nglish 10 (3), 11 (3), 12 (2)	8
arm Crops 1 (3), 2 (3)	6
istory 19 (2)	2
orticulture 14 (3), 2 (3), 3 (3)	9
ibrary 1	R
athematics 17 (3)	3
ilitary 1, 2, 3 or Athletics, 4 or Athletics	R
hysics 205 (3)	3
ils 1 (4), 2 (4)	8
eterinary 16 (2), 18 (2), 19 (1), 44 (2), 55 (2), 56 (1)	10
ology 2 (5), 3 (5), 5 (3), 6 (1), 8 (2)	16
ectives (7), (1)	8
Total	146

HORTICULTURE AND FORESTRY COURSE

	HOURS CREDIT	
	Horticulture Special Line	Forestry Special Line
Agricultural Chemistry 21 (5), 23 (5), 25 (4)	14	14
Agricultural Engineering 1 (2), 2 (2), 4 (4), 8 (1)	9	9
Animal Husbandry 1 (2), 2 (2)	4	4
Botany 5 (3), 11 (4), 15 (3), 30 (4)	14	14
For special Horticultural students 24 (1)	1	
Civil Engineering for special Forestry students 508 (4), 609 (4)		8
Dairying 12 (3)	3	3
Economic Science 9 (3)	3	3
Economic Science 10 or History 6 (each 3 hrs.)	3	3
English 10 (3), 11 (3), 12 (2)	8	8
Farm Crops 1 (3), 2 (3)	6	6
Geology 10 (4)	4	4
History 19 (2)	2	2
Horticulture 1 (3), 2 (3), 7 (2), 8 (3), 9 (2), 13 (2), 14 (3), 15 (2), 19 (1)		
For special Horticultural students 4 (3), 5 (3), 10 (2)	29	
For special Forestry students 16 (2), 17 (3), 18 (2)		28
Library 1	R	R
Mathematics 17 (3)	3	3
Military 1, 2, 3 or Athletics, 4 or Athletics	R	R
Physics 205 (3)	3	3
Soils 1 (4), 2 (4), 13 (2)	10	10
Veterinary 56 (1)	1	1
Zoology 4 (4), 16 (5)	9	9
Electives:		
For Horticultural students (3), (3), (4), (6)	16	
For Forestry students (4), (7)		11
Totals	142	143

AGRICULTURAL ENGINEERING COURSE

	Hours Credit
Agricultural Chemistry 21 (5), 23 (5)	10
Agricultural Engineering 1 (2), 2 (2), 3 (2), 4 (4), 5 (3), 6 (3) 7 (2), 9 (3), 10 (3), 11 (3)	27
Animal Husbandry 1 (2), 2 (2), 20 (2)	6
Civil Engineering 345 (2), 653 (2), 446 (2)	6

	Hours Credit
Dairying 12 (3)	3
Economic Science 9 (3)	3
English 10 (3), 11 (3), 12 (2)	8
Farm Crops 1 (3), 2 (3), 8 (3)	9
History 17 (1), 18 (1)	2
Horticulture 8 (3), 14 (3), 20 (2)	8
ibrary 1	R
athematics 20 (4), 21 (1), 22 (2), 23 (3), 24 (2), 25 (3), 26 (4)	19
echanical Engineering 181 (1), 220 (2), 322 (1), 401 (3), 502 (5), 512 (1), 533 (2), 606 (5), 613 (1), 714 (1)	22
ilitary 1, 2, 3 or Athletics, 4 or Athletics	R
hysics 303 (5), 404 (5)	10
oils 1 (4), 2 (4)	8
eterinary 44 (2)	2
lectives (2), (10)	12
Total	155

SCIENCE AND AGRICULTURE COURSE.

gricultural Chemistry 21 (5), 23 (5), 25 (4), 26 (4)		18
nimal Husbandry 1 (2), 2 (2)		4
otany 5 (3), 11 (4), 15 (3), 24 (1), 30 (4)		15
conomic Science 9 (3)		3
glish 10 (3), 11 (3), 12 (2)		8
rm Crops 1 (3), 2 (3), 4 (2)		8
ology 10 (4)		4
story 4 (3), 19 (2)		5
rticulture 2 (3), 3 (3), 4 (4), 15 (2), 19 (1)		13
erature 4 (3)		3
thematics 17 (3)		3
litary 1, 2, 3 or Athletics, 4 or Athletics		R
ysics 205 (3)		3
ls 1 (4), 2 (4)		8
ology 4 (4), 16 (5)		9
ctives: Choice { Group I (22) and electives (2), (3), (4), (6) Group II (28) and electives (2), (1), (2), (4) }		37
Group I:		
Civics 6 (3), 11 (2), 12 (2)	7	
History 20 (2), 21 (2)	4	
Psychology 1 (5), 5 (3), 6 (3)	11	
Group II:		
Major and supporting line (7), (7), (7), (7). Total, 28.		
Total		141

ELECTIVES IN THE AGRICULTURAL COURSES.

Subjects which may be elected in the Junior or Senior year in an of the Agricultural courses, provided the student has the prerequisite for each study chosen.

Semester	Department, Course Numbers and Hours
First	Agricultural Chemistry 27 (4), 40 (4).
Second	Agricultural Chemistry 26 (4), 34 (4).
First	Agricultural Engineering 3 (2), 4 (4), 7 (2) 9 (3).
Second	Agricultural Engineering 5 (3), 6 (3), 8 (1), 9 (3).
First	Agricultural Journalism 1 (1).
Second	Agricultural Journalism 2 (1).
First	Animal Husbandry 9 (2), 11 (2), 21 (2), 31 (3), 32 (1), 35 (1
Second	Animal Husbandry 7 (2), 12 (2), 30 (3), 33(1), 34 (1), 36 (1
First	Botany 4 (5), 5 (3 or 5), 6 (3), 10 (2), 13 (2), 19 (2), 60 (2
Second	Botany 11 (4), 12 (4), 15 (3), 25 (2), 30 (4), 36 (4).
First	Civil Engineering 308 (4).
Second	Civil Engineering 409 (4), 713 (2).
Second	Civics 5 (1).
First	Dairying 14 (4), 17 (4), 18 (1).
Second	Dairying 11 (4), 13 (2), 16 (1), 20 (4), 21 (2), 24 (3).
First	Economic Science 1 (5), 3 (3), 7 (2), 9 (3).
Second	Economic Science 4 (2), 5 (3), 6 (2), 10 (3), 11 (2).
First	English 7 (1), 13 (2).
Second	English 8 (1).
First	Farm Crops 3 (2), 8 (3), 10 (3), 11 (3).
Second	Farm Crops 4 (2), 10 (3), 12 (2).
First	Geology 501 (5), 704 (4).
Second	Geology 607 (4), 805 (4), 2 (5), 6 (4), 9 (2).
First	History 3 (3), 5 (3), 10 (2), 12 (2).
Second	History 4 (3), 5 (3), 6 (3), 9 (2), 11 (2), 20 (2), 21 (2).
First	Horticulture 1 (3), 5 (3), 8 (3), 9 (2), 18 (2).
Second	Horticulture 4 (3), 7 (2), 10 (2), 15 (2), 16 (2), 17 (3).
First	Modern Languages—
	Language (French) 1 (5), 3 (5).
	Language (German) 5 (5), 7 (5).
	Language (Spanish) 30 (5), 32 (5).
Second	Modern Languages—
	Language (French) 2 (5), 50 (3).
	Language (German) 6 (5), 26 (3).
	Language (Spanish) 31 (5), 38 (3).
First	Literature 1 (3), 4 (3), 6 (2), 8 (2).
Second	Literature 2 (5), 3 (3), 7 (2), 10 (3), 11 (2).
First	Mathematics 8 (5), 24 (2), 25 (3).
Second	Mathematics 9 (5), 23 (3), 26 (4).
First	Military 5 (1), 7 (1).
Second	Military 6 (1), 8 (1).

irst	Physics 509 (2).
econd	Physics 404 (5).
irst	Psychology 1 (5), 5 (3).
econd	Psychology 2 (3), 3 (3), 6 (3).
irst	Public Speaking 3 (2), 5 (2), 9 (1), 10 (2).
econd	Public Speaking 4 (2), 6 (2), 8 (1), 11 (2).
irst	Soils 1 (4), 6 (2), 15 (2), 16 (2).
econd	Soils 2 (4), 7 (1), 8 (3), 10 (1), 14 (3), 15 (2), 16 (2).
irst	Veterinary 19 (1), 23 (2), 33 (3), 44 (2).
econd	Veterinary 22 (2), 24 (2).
irst	Zoology 2 (5), 4 (5), 5 (3 or 5), 10 (3 or 5), 18 (2).
econd	Zoology 3 (5), 6 (1), 8 (2), 10 (3 or 5), 17 (5).

Remunerative and Instructive Labor.

The Agricultural Courses afford opportunity to do considerable work the fields and about the barns and grounds. The compensation for rvices of this kind ranges from eight to fifteen cents per hour according the merit of the work. Thus students are enabled not only to earn rt of their expenses but also to materially strengthen the practical side their education. A number of the strongest and most capable students e aided in finding employment during vacations with successful stock-en on good farms and in various other positions in line with their osen work. Some who have taken a year of practical work in this way ring their course have found it of marked benefit, and it has enabled m to command more desirable and remunerative positions at the com-tion of their College course. Too much emphasis cannot be placed on horough understanding of the practical application of correct principles agriculture.

Credits for Practical Work.

Agricultural students who, by previous agreement with the head of department, do practical work on farms, horticultural or feeding or eding establishments, beet sugar factories or forestry reservations, of gnized standing, during their course of study will be allowed credits the following basis: Students who take practical work of the kind ribed under the direction of the proprietor and render competent faithful service, will, on their return to College and on the presenta- of a concise written report or resume of their observations and expe-ce, be entitled to the following credits in the four year courses in iculture:

For three months, five hours of elective work in the Junior or or year; for six months, eight hours; and for one year, ten hours; ore than five hours of which shall be credited in any one term of College course.

Students must have at least six months of practical work before ation, but credit will be given for such work only as stated above.

Department of Agriculture Scholarships.

The State Department of Agriculture offers scholarship prizes of $200.00, $100.00 and $25.00, open to young men of the state not enrolled as a regular or special student in any agricultural college, without barring the students of the special short courses in January. These scholarship prizes are awarded for the best judging live stock and corn annually at the state fair in accordance with the rules and conditions prescribed by the state department of agriculture governing the contest. These afford opportunities for young men to receive substantial aid toward paying the expenses of a college education, and some excellent students have come to the institution by means of these scholarships.

Mr. J. Ogden Armour of Chicago and the Rosenbaum Live Stock Commission Company of Chicago have donated prizes of $5,000 and $1,000 respectively for competition annually at the International Live Stock Exposition. At the last International the Iowa State College won seven of Armour scholarships of $250 each and $300 of the Rosenbaum prizes. These scholarships are awarded annually to worthy students enrolled in the two weeks short courses and in the regular four year courses.

Agricultural Experiment Station

Agricultural Experiment Station

CHARLES F. CURTISS, DIRECTOR.

W. J. KENNEDY, VICE DIRECTOR.

The investigations of the Experiment Station are intimately related to the college work of instruction, as the problems occupying the attention of the Station are those that have a material bearing on the profit of the farm, and they are also those that are timely and in need of accurate investigation. Whether relating to the field, the feed lot or the laboratory, the aim is to investigate those questions which will have a practical relation to successful agriculture. Originality is made a feature of the work so far as is consistent with useful results, and in all instances the sole object is to throw light on the truth relating to the various principles and practices of the farm. The field work strongly supports the instruction of the College in regard to the varieties of grains and the methods of cultivation, thus enabling the student to become acquainted with the latest ideas relating to these. Tests are made of different varieties of fodders, grasses and grains, also of different systems of culture and various crops.

The experimental investigations with animals embrace a study of the value of different feeds for different features of animal production, the preparation of feeds, systems of feeding, also a study of different types of animals suitable for the requirements of the market. The object sought in this department of Station work is to indicate the manner in which the Iowa farmer, through the employment of animals, can realize the most from his farm products and add to the fertility of the farm. The Experiment Station has reached out in this way to a remarkable degree, bringing sheep from Mexico, Colorado and Scotland; cattle from Texas and Great Britain; horses from Wyoming, Montana and Europe in its endeavor to thoroughly study this very important feature of the farmer's work. The data from these experiments is always accessible to the student who has the opportunity of observing daily the development of it at every stage.

The work of the Experiment Station is in the closest touch with the Dairy industry. The problems which practical men are constantly confronting and asking aid in solving are at all times objects of experimentation by the Dairy Section. The students not only see but assist in carrying out these experiments. In this way they become acquainted not only with the problems to be solved but with the methods employed in the investigations. This experimental work relates to the various problems of both butter and cheese making. The results of this work, together with those of the bacteriological investigations, are daily used in class work.

The experimental work in Horticulture also affords the student an opportunity to study the results of the theory of the class room as practiced in the field. The connection of the Department of Horticulture with the State Horticultural Society is such that problems touching the commercial side of fruit growing receive the closest attention. Experiments are conducted in spraying for the prevention of fungus pests and injurious insects; also in fertilizing, pruning, and thinning; in nursery work and in plant breeding. The Station work thus equips the student with the practice and technique necessary to a thorough horticultural training.

The work of the Experiment Station has been increased by the addition of Forestry as a line of investigation. Methods of practical treatment of fence posts and other timbers to increase durability are being determined in coöperation with the United States Forest Service and farmers and stock men throughout the state. The adaptability of various trees for different sections of the state and methods of germination and storage are being tested. To get more definite data in reference to germination of seed and growth of seedlings in nursery rows, tree seed has been distributed to farmers in twenty-five counties of the state.

A 200 acre dairy farm is being stocked and equipped for experimental and educational work in this important line of work. This farm and its equipment will afford excellent facilities for experimental work in the farm production side of the dairy industry. A poultry department is also being added for experimental and instruction work.

Agricultural Extension Department

Agricultural Extension Department

P. G. HOLDEN, SUPERINTENDENT.

The Agricultural Extension work was established permanently by enactment of the Thirty-first General Assembly of Iowa. This act provided for giving lectures and demonstrations on the growing of crops and fruits, on stock raising, dairying, land drainage and kindred subjects, including Domestic Science. Specific mention was made in this act of instruction in corn and stock judging at agricultural fairs, institutes and clubs and aid in conducting Short Courses of instruction at suitable places throughout the state.

Under this act the Extension Department has been organized by the Board of Trustees of the College, as a department of the Division of Agriculture.

The demand for the extension work was the natural outgrowth of the experimental and instruction work which has been carried on at the College by the heads of the departments in the Division of Agriculture. It was deemed best to separate it from the instruction and experimental work of the College and employ a special staff for the extension work, to avoid interference with the duties of the heads of departments in conducting the College work. There is necessarily a close relation between all of the heads of departments and the extension work in corresponding lines. The Extension Department by action of the Board of Trustees sustains the same relation to the Division of Agriculture and to the College as a whole, as the other agricultural departments, though this work is confined entirely to instruction and demonstrations given in various parts of the state remote from the College, with the exception of such assistance as members of that staff have rendered in connection with the two weeks Short Course held annually at the College in January.

The extension work has met with general favor and been in wide demand. Last year 1,750 calls were received at the College for work of this kind, of which the Extension Department was able to fill 638.

Demonstration work was carried on at ten county farms. 130 corn judging and fourteen stock judging contests were conducted. During the past year Short Courses have been held at Newton, Mt. Pleasant, Red Oak, Avoca. Cedar Rapids, Spencer, Storm Lake, Manchester, Marshalltown, New Providence and Indianola.

Division of Veterinary Medicine

Division of Veterinary Medicince

C. H. STANGE, DEAN AND PROFESSOR.
R. R. DYKSTRA, ASSOCIATE PROFESSOR.
WM. E. MADSON, ASSISTANT PROFESSOR.
H. E. BEMIS, ASSISTANT PROFESSOR.
GEORGE JUDISCH, LECTURER.

The Division of Veterinary Medicine offers a four year course of nine months each. The former curriculum has been revised and enlarged and a course in stock judging and animal nutrition from the department of Animal Husbandry added. This new and longer course has met with general approval as is shown by the increased attendance in face of the advanced entrance requirements and increased length of course of study.

The Veterinary Division occupies the third floor of Agricultural Hall, where offices, lecture rooms and museums are located. The Veterinary hospital is a substantial three story brick building, fitted with commodious, well lighted single and box stalls, operating rooms, office and pharmacy, resident surgeon's room, dissecting room, an elevator for the accommodation of the patients unable to use the runway to second floor, and is furnished with all the surgical instruments of modern construction, operating table and other important conveniences for hospital work. A number of fine grass paddocks directly adjacent to the hospital are used for such patients as are likely to be benefited by outdoor exercise and a grass diet in the season.

The Veterinary Hospital and the daily free clinics furnish an abundance of material for practical work. Situated in an extensive stock growing district, the College is especially favored in this respect, not only horses, but all species of animals, being brought to the hospital for treatment. Senior students are assigned cases for diagnosis and treatment under the supervision of the clinical professor, thus having an opportunity to apply the theoretical knowledge obtained in the class room. During the course opportunity is offered to witness all the different operations performed in veterinary surgery, together with the methods of treating the different internal diseases. Junior students are detailed in alphabetical order to assist the pharmacist in the compounding of prescriptions, in this way becoming familiar with the various forms in which medicines are administered.

Specially equipped laboratories afford excellent opportunity for the study of anatomy, pharmacy, bacteriology, histology, pathology, and the related sciences.

A laboratory intended for the purpose of bacteriological and pathological investigation of the diseases of domestic animals has recently been equipped as a part of the Experiment Station. It is supplied with the most modern biological apparatus, such as high power microscopes, incubators, hot air and steam sterilizers, microtomes, stains, gas, water and electric light, and in fact all first class facilities for scientific investigation. Specimens are received frequently for examination.

Students also have the advantages of a very extensive library, where access may be had at all times to such journals, magazines, experiment station bulletins, and other literature as they may desire for reference in their study. The Veterinary Division occupies the third floor of Agricultural Hall where offices, lecture rooms and museum are located. The College being located in a rich stock growing section of the country, is supplied with an abundance of clinical material for daily demonstration at the hospital.

Aside from the facilities which belong especially to the Veterinary Division, the equipment for instruction in Animal Husbandry, consisting of large flocks and herds of carefully selected breeds of live stock, helps to render practical instruction very efficient.

The work in Botany, Chemistry, Zoology and other related sciences is adequately provided for in the special buildings for the accommodation of these several departments of college work.

Requirements for Admission.

Candidates having a college degree, diploma from an accredited high school or those who have passed successfully the matriculate examination of a recognized college will be admitted without examination.

Graduates from recognized schools of Veterinary Science, Agriculture, Medicine, Dentistry, or Pharmacy will be given credit for work pertaining to the course, upon the presentation to the faculty of satisfactory standing or upon passing an entrance examination.

Examinations and Degree.

Examinations are held at the close of each semester upon the work passed over during that semester. At the end of each year the final examinations are held. Students must have passed examinations in all prerequisite work of a given semester or year before they can proceed with the work of the succeeding semester or year. These examinations are controlled by the faculty rules. At the close of the course after passing a satisfactory examination, the student receives the degree of Doctor of Veterinary Medicine (D. V. M.).

Candidates for graduation must be twenty-one years of age, of good character, and must have passed examinations in all the required subjects in the course.

Field Open to Qualified Veterinarians.

The student having completed the course of instruction outlined in this curriculum becomes a veterinarian in the broadest sense and competent to enter a wide field of usefulness by any of the avenues enumerated.

A.—General Practice.—In view of the fact that the national live stock valuation is estimated at $3,200,000, it becomes obvious that the graduate possessing fitness and aptitude for this kind of work will meet with a ready demand and substantial compensation for his services.

B.—Bureau of Animal Industry.—Veterinarians are in demand for inspection work in the Bureau of Animal Industry, United States Department of Agriculture, at salaries ranging from $1,400.00 to $2,500.00.

C.—Army.—The Veterinarians in the United States Army now have a position similar to that of a commissioned officer. The salary is $1,500.00 per year with a ten per cent increase for each five years' service up to twenty years, with the same allowances as a second lieutenant of cavalry.

These positions are most desirable, and with our insular possessions give opportunities for wide experience in professional work.

D.—Animal Husbandry.—Qualified veterinarians are called upon to act as counsel to the breeder and as guardians to the vast live stock industry of the nation.

E.—Municipal and State Veterinarians.

F.—Veterinarians to stock farms and corporation stables.

G.—Veterinarians to Experiment Stations and Instructors in Veterinary Colleges.

COURSE IN VETERINARY MEDICINE.

Freshman Year.

FIRST SEMESTER.

Veterinary 1	Comparative Anatomy, 3
Veterinary 6	Dissection, 6
Veterinary 25	Pharmacy, 3 (One laboratory period)
Botany 9	Structural Botany, 3 (One laboratory period)
Chemistry 1	Elementary Inorganic Chemistry, 3 (One laboratory period)
Animal Husbandry 11	Feeding and Management of Live Stock, 2 (One laboratory period)
Military 1	Military Drill

SECOND SEMESTER.

Veterinary 2	Comparative Anatomy, 3
Veterinary 7	Dissection, 6
Veterinary 22	Comparative Physiology, 2
Botany 16	Poisonous Plants, 2 (One laboratory period)
Chemistry 4	General Chemistry, 3 (One laboratory period)
Animal Husbandry 12	Feeding and Management of Live Stock, 2
Military 2	Military Drill

Sophomore Year.

THIRD SEMESTER.

Veterinary 3	Comparative Anatomy, 3
Veterinary 8	Dissection, 6
Veterinary 23	Comparative Physiology, 2
Veterinary 54	Physical Diagnosis, 2
Veterinary 27	Materia Medica, 2
Veterinary 33	Histology, 3 (One laboratory period)
Animal Husbandry 1	Market Types of Cattle and Sheep, 2 (Two judging periods)
Zoology 15	General and Vertebrate Zoology, 5 (Two laboratory periods)
Chemistry 10	Elementary Organic Chemistry, 2
Military 3	Military Drill, or Athletics

FOURTH SEMESTER.

Veterinary 4	Comparative Anatomy, 3
Veterinary 9	Dissection, 6
Veterinary 24	Comparative Physiology, 2
Veterinary 34	Histology, 3 (One laboratory period)
Veterinary 16	Horse Shoeing, 2
Animal Husbandry 2	Market Types of Dairy Cattle, Horses and Swine, 2 (Two judging periods)
Chemistry 13	Physiological Chemistry, 3 (One laboratory period)
Military 4	Military Drill, or Athletics

Junior Year.

FIFTH SEMESTER.

Veterinary 40	Theory and Practice of Medicine, 3
Veterinary 10	Principles and Practice of Surgery, 3
Veterinary 35	General Pathology, 3 (One laboratory period)
Veterinary 50	Clinics, 6
Animal Husbandry 3	Breed Types of Cattle anl Sheep, 4 (Two lectures and two judging periods)
Animal Husbandry 20	Animal Feeding, 2
Zoology 5	Embryology, 3 (One laboratory period)
Botany 31	Bacteriology of the Pathogenes, 2 (One laboratory period)

SIXTH SEMESTER.

Veterinary 41	Theory and Practice of Medicine, 3
Veterinary 11	Principles and Practice of Surgery, 3
Veterinary 36	General Pathology, 3 (One laboratory period)
Veterinary 51	Clinics, 6
Veterinary 30	Therapeutics, 2
Animal Husbandry 4	Breed Types of Dairy Cattle, Horses and Swine, 4 (Two lectures and two judging periods)
Animal Husbandry 8	Animal Breeding, 2
Zoology 8	Animal Parasites, 3 (One laboratory period)
Dairying 13	Milk Testing and Milk Inspection, 2 (One laboratory period)

Senior Year.

SEVENTH SEMESTER.

Veterinary 42	Theory and Practice of Medicine, 3
Veterinary 12	Principles and Practice of Surgery, 3
Veterinary 37	Special Pathology, 3
Veterinary 52	Clinics, 6
Veterinary 32	Therapeutics, 2
Veterinary 14	Operative Surgery, 5
Veterinary 44	Sanitary Science, 2
Veterinary 19	Obstetrics, 1
Veterinary 39	Meat Inspection, 2

EIGHTH SEMESTER.

Veterinary 43	Theory and Practice of Medicine, 3
Veterinary 13	Principles and Practice of Surgery, 3
Veterinary 38	Special Pathology, 3
Veterinary 53	Clinics, 6
Veterinary 15	Operative Surgery, 5
Veterinary 45	Sanitary Science, 2
Veterinary 20	Obstetrics, 1
Veterinary 47	Hippology, 2
Veterinary 18	Conformation and Soundness, 2
Veterinary 48	Jurisprudence, 1
Veterinary 49	Ophthalmology, 1

COURSES IN VETERINARY MEDICINE.

Comparative Anatomy.

DR. DYKSTRA.

1. **Comparative Anatomy.** First semester Veterinary Course. Three lectures per week.

2. **Comparative Anatomy.** Second semester Veterinary Course. Three lectures per week.

3. **Comparative Anatomy.** Third semester Veterinary Course. Three lectures per week.

4. **Comparative Anatomy.** Fourth semester Veterinary Course. Three lectures per week.

6. 7, 8 and 9. **Dissection.** Freshman and Sophomore years in Veterinary Course. Six hours per week.

The courses in Comparative Anatomy include both Descriptive and Comparative Anatomy. Descriptive Anatomy includes the study of bones, articulations, muscles, circulatory apparatus, and special sense organs. This work is given by lectures supplemented by demonstrations from mounted skeletons, prepared specimens, charts and an Auzoux clastic model.

Practical Anatomy includes a course in dissection. During each year the student makes two complete dissections of the horse and such parts of other animals as is deemed necessary. The first year's work is devoted to the study of bones, articulations and muscles; the second, to special dissection of the nervous system, circulatory apparatus, lymphatic glands, organs of special sense and the organs contained in the abdominal and thoracic cavities. Each student must properly dissect and pass an examination on the part assigned before starting the dissection and study of another part.

Principles and Practice of Surgery.

DR. BEMIS.

10. Principles and Practice of Surgery. Fifth semester Veterinary Course. Three lectures per week.

11. Principles and Practice of Surgery. Sixth semester Veterinary Course. Three lectures per week.

12. Principles and Practice of Surgery. Seventh semester Veterinary Course. Three lectures per week.

13. Principles and Practice of Surgery. Eighth semester Veterinary Course. Three lectures per week.

General Surgery includes Surgical bacteriology, the pathology and treatment of inflammation, diseases of the bones, nerves, muscles, articulations, tendons, tendon sheaths and bursæ; methods of amputation and ex-articulation, suturing and the general treatment of wounds; methods of anæsthesia; intravenous, and sub-cutaneous injections; castration; methods of restraint in securing animals, and methods of actual cautery.

Special Surgery includes the surgical diseases of the head, neck, thorax, abdomen, urino-genital organs, fore-limb, hind-limb, vertebrae, pelvis, stomach and bowels.

Operative Surgery.

14. Operative Surgery. Seventh semester Veterinary Course. Students perform all the operations necessary in veterinary practice. Five hours per week. Fee, $10.00.

15. Operative Surgery. Eighth semester Veterinary Course. Continuation of Course 14. Five hours per week.

Horse Shoeing.

16. Horse Shoeing. Fourth semester Veterinary Course and eighth semester Animal Husbandry Course. Study of anatomy and physiology of foot, relation between form of foot and direction of limb, variation in flight of limb, style of going, shoeing of normal and irregular feet, winter shoeing, hoof nurture, correction of defects in gait, and the methods of shoeing hoofs defective in form or diseased. Two lectures per week.

Conformation and Soundness.

18. Conformation and Soundness. Eighth semester Veterinary and Animal Husbandry Courses. Study of conformation of horse with special reference to defects which exist and predispose to pathological changes causing unsoundness, comparison of normal and diseased parts, and a systematic classification arranged to conform to parts involved. Lectures and practical demonstration upon the animal. Two lectures per week.

Obstetrics.

DR. DYKSTRA.

19. Obstetrics. Seventh semester Veterinary and Animal Husbandry Courses, and elective Agricultural Courses. Consists of physiological obstetrics; ovulation, oestrum, fecundation, sterility, gestation, and hygiene of pregnant animals, and parturition. Prerequisite, Zoology 5. One lecture per week.

20. Obstetrics. Required second semester Senior year in Veterinary Course. Consists of pathological obstetrics; the diseases and accidents of pregnancy, dystokia, obstetrical operations, the sequelæ of parturition, and diseases of the young animal. One lecture per week.

Comparative Physiology.

DR. MADSON.

22. Comparative Physiology. Second semester Veterinary and elective Agricultural Courses. A study of general physiology, dealing with the animal cell, the unit of organization, its origin, modification of form and structure, chemical constitution and the various chemical and physical laws which affect its nutrition, growth, reproduction and development. Two lectures per week.

23. Comparative Physiology. Third semester Veterinary, and elective Agricultural Courses. Deals with special functions of various organs and tissues of the body. Two lectures per week.

24. Comparative Physiology. Fourth semester Veterinary and elective Agricultural Courses. Continuation of Course 23. Lectures, two hours per week.

Physiology is taught by comparing vital phenomena of domestic animals with those of human beings. In all these courses, F. Smith's Manual of Veterinary Physiology is used as a text.

Pharmacy.

MR. JUDISCH.

25. Pharmacy. First semester Veterinary Course. A study of all official drugs and preparations. Special attention is paid to practical pharmaceutical problems and manipulations, also to the principles and practical work in compounding prescriptions. Each student is required to prepare at least one of each class of official preparation. Credit three hours. Lectures, two hours, and laboratory, three hours, per week. Fee, $2.00.

Materia Medica.

DR. MADSON.

27. **Materia Medica.** Third semester Veterinary Course. This course is introduced by definitions and a discussion of composition of drugs, classification of official preparation, incompatibilities and classification of all drugs employed in the practice of Veterinary Therapeutics. Following this, each drug is taken up in order of its classification and discussed in general detail. Lectures, two hours per week.

Therapeutics.

DR. MADSON.

30. **Therapeutics.** Sixth semester Veterinary Course. Same classification of drugs is used as in Course 27. A study of modes of action of drugs, the physiological laws governing the same, the absorption, elimination and methods of administration, dosage, idiosyncrasy; also the physiological and therapeutic actions, indications and contra-indications, toxicology and treatment, modes of administration and dose of each therapeutic agent. Two lectures per week.

32. **Therapeutics.** Seventh semester Veterinary Course. Continuation of Course 30. Reference, Winslow's "Veterinary Materia Medica and Therapeutics" and other standard works. Two lectures per week.

Histology.

DRS. STANGE AND BEMIS.

Histology proper is preceded by a short course in Microscopy. This is designed to give the student a working knowledge of the microscope and microscopical methods, thus fitting him to study, to best advantage, the minute structure of tissues and organs.

33. **Histology.** Third semester Veterinary Course, and elective Science and Agricultural Courses. Treats of the cell as a unit of structure, of its functions, the tissues, their classification and characteristics. Credit, three hours. Recitations, two hours, and laboratory, three hours, per week. Fee, $2.00.

34. **Histology.** Fourth semester Veterinary Course. Treats of the tissues in their relation to the structure of organs. Credit, three hours. Recitations, two hours, and laboratory, three hours, per week.

Pathology.

DR. STANGE.

35. **General Pathology.** Fifth semester Veterinary Course. Treats of causes of disease, its spread and generalization, protecting and healing forces, disturbances of circulation, retrograde disturbances of nutrition, and infiltration, hypertrophy and regeneration, inflammation and tumors; also the methods of preparation and preservation of gross specimens, preparation of sections for microscopic study, general technique of laboratory diagnosis. The student is then given preparations for the study of the various pathological phenomena as considered in class room. Recitations, two hours, and laboratory, three hours, per week. Fee, $2.00.

36. **General Pathology.** Sixth semester Veterinary Course. Continuation of Course 35. Recitations, two hours, and laboratory, three hours, per week.

37. **Special Pathology.** Seventh semester Veterinary Course. Treats of the etiology and morbid anatomy of diseases caused by streptococci, bacilli, higher fungi, protozoa, animal parasites, and those infectious diseases, the specific cause of which is not yet determined. Recitations, three hours per week.

38. **Special Pathology.** Eighth semester Veterinary Course. Continuation of Course 37. Recitations, three hours per week.

Meat Inspection.

DR. MADSON.

39. **Meat Inspection.** Seventh semester Veterinary Course. Includes the physical characteristics of normal flesh and organs; methods of slaughter; principles of refrigeration and preservation; effect of accidental and pathological conditions on the preservation and edibility of meats; putrefaction of meats and consequences of ingestion of such meats by man; effects upon the meat of various constitutional and infectious diseases; transmissibility of disease to man and effects of cooking on transmissibility; and the meat inspection laws of the United States. Two lectures per week.

Theory and Practice of Veterinary Medicine.

DR. STANGE.

40. **Theory and Practice of Veterinary Medicine.** Fifth semester Veterinary Course. Includes work on congestion, inflammation and fever, diseases of the respiratory system, circulatory system, blood and lymph,

digestive apparatus, nervous system, genito-urinary system, eye and skin, and the non-infectious constitutional diseases. Three lectures per week supplemented by practice in daily clinics.

41. Theory and Practice of Veterinary Medicine. Sixth semester Veterinary Course. Continuation of Course 40. Three lectures per week.

42. Theory and Practice of Veterinary Medicine. Seventh semester Veterinary Course. Continuation of Courses 40 and 41. Three lectures per week.

43. Theory and Practice of Veterinary Medicine. Eighth semester Veterinary Course. Devoted to history, etiology, symptoms, lesions, differential diagnosis and treatment of the various diseases caused by animal parasites; also a review of the morphological and cultural characteristics of the specific organisms in connection with the symptoms and lesions which they produce. Three lectures per week.

Sanitary Science.

DR. MADSON.

44. Sanitary Science. Seventh semester Veterinary, Animal Husbandry, Agricultural Engineering, and Dairy Courses, and elective Agricultural Courses. Consists of a consideration of health and disease; the etiology of disease, predisposing and exciting; means and manner of propagation and transmission of infectious diseases; general hygiene and stable sanitation, including ventilation, drainage, selection of site and materials for construction. Two lectures per week.

45. Sanitary Science. Eighth semester Veterinary Course. A consideration of practical methods of disinfection, disinfecting agents both chemical and physical, methods of dipping and dips, principles of serum therapy, vaccination and quarantine; also sanitary police of the individual infectious and parasitic animal diseases Two lectures per week.

Hippology.

47. Hippology. Eighth semester Veterinary Course. How to maintain the health and strength of the horse, including the framework of the horse from a mechanical standpoint, bits and bitting, saddling, draft and harness; care of animals in garrison and in field, including watering, feeding and grooming. Two lectures per week.

Jurisprudence.

HON. C. G. LEE.

48. Jurisprudence. Eighth semester Veterinary Course. Consists of a study of rights and duties of the veterinary practitioner and of the owner of domestic animals; contracts and sales as applied to dealings in live stock; and the subject of expert testimony. One lecture per week.

Ophthalmology.

DR. STANGE.

49. Ophthalmology. Eighth semester Veterinary Course. Methods of examination and diagnosis in particular, as well as general principles and special forms of treatment. One lecture per week supplemented by demonstrations upon cases and models.

Clinics.

DRS. STANGE, DYKSTRA AND BEMIS.

50, 51, 52, and 53. Clinics. Required throughout the Junior and Senior years in Veterinary Course. The practical work afforded by the clinics gives the student an opportunity to put his knowledge into practice and to acquire the aptitude requisite for his professional work. Free clinics are held at the hospital every day from 1 to 3 o'clock P. M. The cases brought to the hospital for treatment are assigned to the senior students who are required to prepare a full report of their examination, diagnosis, and proposed treatment, which are then graded by the clinician when he examines the case. The hospital cases are also treated and reported on by the senior students. The clinical professor, when examining a case, performing an operation, or administering internal treatment, discusses the various aspects of the case, thus giving the utmost good to the student. The junior students assist the seniors in their clinical and hospital work. The large number of animals of all species brought to the hospital afford the student an opportunity to acquire a familiarity with their treatment such as will enable them to give good service to clients immediately upon entrance into practice. Six hours per week during each semester.

Physical Diagnosis.

54. Physical Diagnosis. Third semester Veterinary Course. Arts nd methods of diagnosis first considered, then general examination of ifferent apparatuses of the animal body, and finally specific examinations, ncluding experimental inoculations as a means of diagnosis. Two lecures per week.

Anatomy of Domestic Animals.

DR. DYKSTRA.

55. Anatomy of Domestic Animals. Seventh semester Animal Husbandry Course. Two hours credit.

56. Anatomy of Domestic Animals. First semester all Agricultural Courses except Agricultural Engineering and Science and Agriculture. One hour credit.

TEXT AND REFERENCE BOOKS.

Dictionary.—Dorland and Gould.

Anatomy.—Chauveau's "Anatomy of the Domesticated Animals," McFadyean's "Comparative Anatomy," Strangeway's "Veterinary Anatomy," McFadyean's "Dissection Guide," Sshmaltz's "Atlas der Anatomie de Pferdes."

Physiology.—F. Smith's "A Manual of Veterinary Physiology," "American Text Book of Physiology."

Histology.—Szymonowiez-MacCullum. Böhm-Davidoff-Huber. Stöhr's. "Essentials of Histology," Louis Leroy. "Manual of Histology and Organography," Hill. Ellenberger's "Vergleichenden Mikroskopischen Anatomie der Haustiere."

Materia Medica.—"United States Dispensatory."

Pharmacy.—Remington's "Practice of Pharmacy."

Chemistry.—Bennett's "General Chemistry and Qualitative Analysis," Remsen's "Organic Chemistry," Bunge's "Physiological Chemistry."

Botany.—Atkinson's "Elementary Botany."

Therapeutics.—Winslow's "Veterinary Materia Medica and Therapeutics," "Arzneimittellehre für Tierärzte," by Fröhner, Veterinary Medicine, Dun.

General Pathology.—McFarland, Zeigler, Stengel. "Comparative General Pathology," by Kitt. "Chemical Pathology," Wells. "Manual of Pathology," McConnell.

Special Pathology.—Moore, Hayes' Translation of "Infective Diseases of Animals," by Friedberber and Fröhner. Specielle Pathologie und Therapie der Haustiere by Hutyra and Marek.

Zoology.—Comstock and Kellogg's "Elements of Insect Anatomy," for beginners; none for advanced work.

Bacteriology.—Muir and Ritchie's "Manual of Bacteriology."

Animal Husbandry.—Craig's "Judging Live Stock."

Surgery.—Dollar's. Volume I., Operative Technique.
Dollar's. Volume II., General Surgery.
Dollar's. Volume III., Regional Surgery.
William's Surgical Operations.

Medicine.—Law's "Veterinary Medicine," Hayes' Translation of "Infective Diseases of Animals," by Friedberger and Fröhner.

Animal Husbandry.—Shaw's "Animal Breeding."

Animal Breeding.—Davenport's.

Embryology.—Foster and Balfour's "The Elements of Embryology." "An Introduction to Vertebrate Zoology," A. M. Reese.

Horseshoeing.—"A Text Book of Horseshoeing," by Lungwitz, translated by Adams. "Handbook of Horseshoeing," by Dollar.

Milk Inspection.—Farrington and Woll.

Obstetrics.—Fleming's "Veterinary Obstetrics," Bourney, "Obstetrique Veterinaire," Dalrymple's "Veterinary Obstetrics," De Bruin's "Bovine Obstetrics," translated by Wyman.

Animal Nutrition.—Jordan's "The Feeding of Animals," Henry's "Feeds and Feeding," Armsby's "Principles of Nutrition."

Conformation and Soundness.—Goubaux and Barrier's "Exterior of the Horse," translated by Harger; Hayes' "Points of the Horse."

Division of Engineering

Division of Engineering

A. MARSTON, DEAN,
Professor of Civil Engineering.

S. W. BEYER, VICE DEAN.
Professor of Mining Engineering and Geology.

L. B. SPINNEY,
Professor of Electrical Engineering and Physics.

W. H. MEEKER,
Professor of Mechanical Engineering.

The work of the Division of Engineering of the College is apportioned among four departments, viz.:

The Department of Mechanical Engineering.
The Department of Civil Engineering.
The Department of Electrical Engineering.
The Department of Mining Engineering.

Through these departments the College offers systematic four year and five year courses in Mechanical Engineering, Civil Engineering, Electrical Engineering, and Mining Engineering. A four year course in Ceramics, and two year courses in Mining Engineering and Clay Working.

NEW FIVE YEAR ENGINEERING COURSES OF STUDY.

The engineering graduates of the Iowa State College have now come to occupy so many positions of responsibility that there has come from them a strong demand for longer and broader training of part of the engineering students for executive and other positions of large responsibility than can be given by the four year courses of study, such as are standard in the principal engineering schools of the country.

The fact is that in the marvelous advance of civilization in recent years the place of the engineer has become continually more important, and more and more responsibilities of the widest character are placed upon him. To furnish opportunity for the training of such men, new five year engineering courses of study are being established, and all engineering students who can afford the necessary time and expense are urged to take this course in preference to the four year course.

NEW COURSE IN CERAMICS.

At the instance of the Iowa Brick and Tile Manufacturers' Association, and of the Association of Iowa Cement Users, the legislature recently passed a law establishing instruction and experimentation along these lines at the State College.

In obedience to the law a four year course of study in Ceramics has been established, and the proper facilities for instruction and experimentation in the lines of cement and clay products have been provided.

Iowa has great undeveloped resources in these lines which offer an inviting and remunerative field for professional work. We already have calls for graduates to take remunerative positions in the cement industries, and many excellent opportunities offer in the clay industries.

The Engineering Courses.

The several courses are planned with a view to fitting those pursuing them to enter professional engineering work and to advance therein more rapidly than would be possible without the preparation furnished by a college course. Experience shows that the graduates from technical schools generally excel in their chosen lines, and it is worthy of note in this connection that railroads, manufacturers and other corporations, as well as municipalities and government departments, are demanding that those who seek promotion in their technical departments shall have secured a technical training such as can now be obtained in the engineering schools of the country.

It is very manifest, because of the lack of time in the course, the multiplicity of general subjects which must be emphasized and the lack of uniformity of details in the profession due to the local and personal differences which exist in the conduct of engineering work of all kinds that no college course in engineering can give to a student training and experience in all the details of his profession. Moreover it seldom happens that a student in college knows definitely what specific branch of his chosen profession he will follow, and it would be folly for him to spend his time on details which he may never use. A thorough education in the branches of pure and applied science which are related to professional work is essential. Having this, the engineer readily acquires familiarity with the details of his work. Without it no amount of experience with details alone can give an engineer high rank in his profession.

Therefore it is believed that a college course in engineering should be in the first place a training of the mind of the student toward ability to think logically, to observe accurately and by the application of the former acquirement to the latter to reach correct inferences; in the second place such a course should acquaint the student with approved methods of draughting and computing, with the use and limits of the instruments employed in the every day work of his profession, and should give him an opportunity for experimental work bearing upon engineering problems; in the third place such a course should provid that the student acquire the art of expressing himself, publicly and privately, in good English and should furnish him with some knowledge of the history of his own and preceding times, thus equipping him to be an ornament to his profession, and an enlightened member of society.

In accordance with the views above expressed the engineering courses of this college include a variety of studies. These may be conveniently grouped as culture studies, training or disciplinary studies, professional studies, and practical work.

The culture studies include History, English, Modern Language, Economic Science and Civics. Thorough work in English is especially necessary in the training of the engineer to enable him to express himself with the utmost clearness and conciseness, in his reports and in papers on technical subjects. No one can attain great success as an engineer who fails in these particulars. His success in carrying out projects upon which he is engaged will often depend upon his ability to convince his superiors or public officials of the correctness of his views. The really successful engineer must also come in close contact with other members of his profession, and must exchange information of value with them through the medium of papers on technical subjects. For the attainment of these ends the engineer should give especial attention to the thoroughness of his training in English. Modern language, either French, German, or Spanish not only gives access to the technical foreign literature but also aids the work in English. History, Economic Science, and Civics cultivate interest in mankind at large and are thus broadening to the student.

The training studies include three years of Mathematics and two or three years of Physics, the very backbone of engineering and of the training of the engineer because by their study are secured habits of logical thinking and a knowledge of the fundamental principles of matter—the laws of nature; also one or more years work in Chemistry where the habits of observing and recording facts are thoroughly instilled.

Considerable time in the Junior and Senior Years is given by all engineering students to work having practical bearing on their profession; the object being to correlate, in some measure, theory and practice.

Draughting, shop work and field work are begun upon entrance and continued in proper proportions throughout the several courses. By this means students are frequently able to obtain valuable practical experience during their vacations and are thereby, in turn, benefited by being able to see the usefulness of their college work more clearly than before.

By such vacation work the student is placed in a measure, in the position of the so-called practical engineer, who, if he be honest with himself, wishes for the advantages of a technical education.

In the professional studies the student, through his teachers, text books, and actual practice, gets into touch with the problems which the engineers of the day are trying to solve, and thus learns to appreciate the difficulties which confront them.

The professional and practical studies culminate in the graduation thesis in which the student is expected to show energy, determination, resourcefulness and discrimination in the solving of a problem whose solution will add something to the store of engineering knowledge.

A certain amount of undergraduate work and a large amount of graduate work as well as the research work carried on by the individual members of the engineering faculty is devoted to the various industrial interests of the state.

Advanced students are given an opportunity to assist in all research or commercial work which is being conducted by the engineering departments.

Improvement of Engineering Courses.

Thorough revision and improvement of the engineering courses have just been completed. The Senior years of the improved courses will be in force now for the first time. Many improvements and advances are being introduced, which will have the effect of still further advancing the standards of the engineering courses.

FIVE YEAR ENGINEERING COURSES OF STUDY.

The new five year engineering courses of study, already referred to, are published in this catalog for the first time. As compared with the four year courses of study, they contain a much larger amount of general culture subjects, much wider opportunity for choice of electives, and some dvanced engineering subjects.

The added culture work includes advanced English, advanced History, nd nine to twenty-six hours of elective work. This considerable amount f electives will permit of the selection for each student of general and cientific subjects of such a nature as will be best suited to his particular eeds.

In addition, there will be opportunity in the advanced courses for the ursuit of advanced engineering work along lines selected by each student.

These five year courses will be of great benefit to those who can pur- ue them, combining much of the advantages of a general college train- g with very thorough technical instruction. It is generally admitted that e ideal training for the engineer would be a complete general college urse plus a complete engineering course, but the time and expense of e two courses places such ideal training beyond the reach of practically l. The five year courses will be found to be within the reach of every ident, even those who must earn the money to pay their own way rough college, and all students are urged to take them.

The five year courses are now arranged so that students already pur- ing the four year courses can do the additional year of work, should y so elect, at any time while they are in college.

Demand for I. S. C. Engineering Graduates.

The engineering graduates of the College are scattered in remunerative and most responsible positions over the entire world. The demand for them is, in normal times, constantly greater than the supply. Many of the seniors are engaged long anterior to commencement.

The graduates are scattered from Panama to Alaska, and from New York to the Philippines, with large representation at the principal centers of engineering work. Their representation at such centers is so large that I. S. C. Alumni Associations are numerous throughout the United States and on both coasts of the same, and one exists even in the Philippine Islands.

The George W. Catt Engineering Library.

A signal example of the loyalty to the College of its engineering graduates has been presented in the bequests to the College by Mr. George W. Catt, C. E., '82, who was President of the Atlantic, Gulf and Pacific Dredging Co., and who, on his death, bequeathed to his Alma Mater his extensive engineering and economic libraries and one-half of his large fortune.

The engineering library has been placed in Engineering Hall, in conjunction with the engineering books and periodicals from the general college library, and thus through Mr. Catt's devotion, the engineering students are afforded free access to the best engineering literature. Extensive use of these library privileges is strongly urged on all engineering students. Only by extensive technical reading, especially of the current periodicals, can one become a worthy member of the engineering profession.

Buildings and Equipment.

The buildings occupied exclusively by the Division of Engineering are the Engineering Hall, the Structural and Hydraulic Laboratory, the Power Station, the Foundry, the Pattern Shop, the Locomotive Laboratory, the Forge Shop and the Machine Shop. For full description see index under "Buildings."

COURSES IN ENGINEERING.

The following general courses are given by the Dean, Vice Dean and the Professor of Mechanical Engineering, and are included in the courses of study in each of the engineering departments.

603. **Conservation of our Natural Resources.** Engineering Courses. The course embraces a study of ways and means not only of preventing unnecessary destruction of our natural resources by unwise use, but also of preventing waste of our natural resources from disuse. Incidentally an inventory of our natural resources is compiled during the progress of the work. Lecture, one hour per week.

702. Specifications and Contracts. Engineering Courses. Principles of engineering contract law, business methods, specifications for engineering construction. One recitation or lecture per week.

801. History of Engineering. Engineering Courses. The early development of engineering, as traced from history and from the remains of ancient works; development of engineering in later periods and its growth into a separate profession; the effect on civilization, general history and economic problems of the several inventions and other improvements which have marked the development of engineering; study of lives of more famous engineers; also the development of the general technical principles of engineering. One hour per week.

DEPARTMENT OF MECHANICAL ENGINEERING.

W. H. MEEKER, PROFESSOR.

C. C. MAJOR, M. P. CLEGHORN, ASSOCIATE PROFESSORS.

F. G. ALLEN, R. A. NORMAN, AND R. H. PORTER, ASSISTANT PROFESSORS.

J. G. HUMMEL, E. C. POTTER, J. W. CAMERON, JOHN SAWIN, J. B. VARELA, T. R. MINERT, E. M. SPANGLER, JOHN T. BATES, INSTRUCTORS.

R. L. SPENCER, N. LEERBERG, P. SEXSMITH, STUDENT ASSISTANTS.

The headquarters of this department are in Engineering Hall. The principal offices are on the second floor. On this floor are a lecture room and a combination class and drawing room. On the first floor are two rooms devoted to research work in mechanical engineering. On the fourth floor are two drafting rooms accommodating 160 students at one time, fitted with combination drawing tables, instrument cabinets and boards, whereby 480 students can be assigned to mechanical drawing and designing in the department. In conjunction with these rooms is a commodious office for the instructing staff in drawing. In addition the department has a common interest in and use of a photographic room, a blue print room on the fourth floor, the engineering museum, and faculty room on the third floor and the assembly room on the second floor.

The draughting, class and lecture rooms are equipped with ample blackboard space and the offices are fitted with convenient furniture for efficient and accurate administration of the interests of the department.

In addition to the above space in the new Engineering Hall, the department occupies the Engineering Laboratory, the Power House, the Machine Shop, Forge, Foundry, the Pattern Shops, and the Locomotive Laboratory.

In the Engineering Laboratory the hydraulic laboratory is used conjointly with the Department of Civil Engineering, the first, second, and third floors are used for general engineering laboratory work.

Shop Work.

Students in mechanical engineering pursue the full course in shop work, which consists of six hours per week for three and one-half years. Partial courses are given to students in mining and electrical engineering.

The system of instruction in the several shops begins with graded exercises calculated to familiarize the student with tools and with the materials used. The exercises are supplanted as soon as possible by work on machines or parts thereof which are to be put into actual use. By this arrangement greater interest is maintained in the work than would be possible with a strict adherence to the exercise system. The object of the shop work is not to teach trades, but to acquaint the student with the tools, materials and difficulties of shop practice and to establish in the mind principles which will aid him in designing and construction work, in the other studies of his course and in his professional career.

The Machine Shop is a new brick building 150 feet long by 45 feet wide and has a main floor and gallery. At one end of the main floor are located locker room, reading room and office. The tool room is placed near the middle of the shop with room inclosed in the gallery above for small stores.

The Machine Shop is equipped with a twenty-four by twenty-four inch planer, a milling machine, a universal grinding machine, a shaper, a drill press, two emery grinders, a polishing wheel, a power hack saw, a cutting off machine, thirteen engine lathes of capacities from ten to twenty inch swing and three to ten feet between centers, and three speed and drilling lathes together with usual assortment of small tools in the tool room. Power is furnished to this shop by an electric motor.

The Pattern Shop is a brick building, one story high with spacious attic for storage of lumber. The building is one hundred and twenty feet long by forty feet wide. A tool room twelve by twenty feet is screened off in the center. A fire proof room is provided for patterns. The equipment of the pattern shop consists of a universal buzz saw, a mortising machine, planer, buzz planer, band saw, jig saw, grindstone, fifteen turning lathes, benches for thirty students, thirty complete sets of small tools and a number of special tools. Power for this building is furnished by a twenty horse power electric motor.

The foundry equipment is housed in a brick building eighty by forty feet. A steel truss roof structure of substantial construction provides support for an overhead traveling crane, which serves the whole floor for handling heavy ladles and castings. A cupola and blower for melting cast iron, a brass furnace, a core oven, core benches, twenty four sets of moulder's tools, crucibles, and a large assortment of flasks are used for foundry work.

The Forge Shop is housed in a new brick building 38x78 feet, with a store room. Thirty forges, an oil burning annealing and tempering furnace, donated by the Rockwell Engineering Co., with blower and exhaust fan, drill press, vises, anvils, grindstone and small tools, such as sledges, fullers and swages, constitute the equipment for forge work.

Electric motors supply power for the forge and foundry.

Students are advised to work in outside shops during their vacations. Credit is frequently given on work required in the regular course for such commercial experience.

Drawing.

A preparatory course in freehand and linear perspective is given in the Academic year. The regular drawing room work of the course begins with Mechanical Drawing given in the first semester of the Freshman year. This is followed successively by projective drawing, machine sketching and detailing, kinematic drawing, and designing. The last two years of the course are given up to designing.

The object sought by the drawing room course is to enable the student to make, as quickly as possible, neat and accurate working drawings, to design, in general and in detail, machines or parts thereof, and to apply throughout his knowledge of shop methods and his theoretical information acquired in the laboratory and class room.

The two large drawing rooms on the fourth floor of Engineering Hall and a part of the combination drawing and class room on the second floor of the same building are equipped with fifty combination drawing tables, each accommodating four students at once. The drawing boards are placed in frames adjustable as to height and angle and equipped with parallel rulers. Each unit has twelve drawers which are assigned to students for their drawings, instruments and supplies. Extra drawing boards are supplied so that each place can be used by more than one student at different periods.

An extensive collection of blue prints, photographs, drawings, and trade catalogues, as well as machines and parts thereof, constitute an important part of the working equipment in this branch of the work.

Experimental Engineering.

Experimental work begins with the Junior year and extends to the end of the course. The instruction in this work is thorough, its scope being indicated by the following list of experiments:

Tensile, transverse, torsion and compression tests of materials, properties of lubricants, measurements of power by absorption and transmission dynamometers, steam gauge and indicator spring calibration, flue gas analysis, indicator practice, variation of engine speed, fan-blower tests, calorimetry, including throttling and separating calorimeters, weir and water meter calibration, efficiency tests of steam engines, boilers, gas producer and engine, injectors, and steam heating, electric lighting, refrigerating, power and pumping plants, and thermal analysis of the steam engine, coal calorimetry, besides a number of special experiments in the line of investigation. Tests on power plants outside of the College are made as frequently as possible. The engineering laboratory work usually culminates in the thesis, which is an exhaustive investigation of a limited subject. From four to five hundred hours of actual time are spent on theses by students in the engineering courses.

The old and new power houses contain the complete electric light and power and pumping plants of the College, all of which are available for experimental work, and constitute a part of the engineering laboratory equipment of the engineering departments of the College. In the power houses are a 51-H. P. Babcock & Wilcox boiler, two 264-H. P. Cahall horizontal water tube boilers, with Roney mechanical stokers with induced draught, two 260-H. P. Sterling boilers with special furnaces and induced draught, a 250-H. P. Corliss engine direct connected to 150 K. W. generator, a 75-H. P. Straight Line engine, a 50-H. P. Ball engine, with five dynamos for alternating and direct current from 15 to 60 kilowatt capacity. In addition to the above, the engineering laboratory equipment of the department consists of a 50-H. P. Fairbanks, Morse & Co.'s suction gas producer and engine equipped with absorption brake, a 25-H. P. Harris Corliss engine with Alden absorption brake, a twelve horse power Otto gasoline engine, an Ericsson Hot Air Engine, a Wheeler condenser, three Worthington and three other water meters, two Venturi meters, a Pelton water motor, a Holly duplex pump, a Morris Machine Works centrifugal pump, injectors, weir and weighing tanks, gas meters, a Crosby steam gauge tester, fan blowers for experimental work, Westinghouse and New York air pumps, a 100,000 pound Riehle testing machine with Gray autographic device, a 50,000 pound Olsen testing machine, an Olsen torsion testing machine, a Doolittle viscosimeter, a Thurston oil tester, a complete De La Vergne refrigerating machine, gas and air analysis apparatus, anemometers, two Thompson, five Crosby, two Star, and one Richards indicators, dynamometers, a Prony brake, Parr coal calorimeter, platform scales and other apparatus essential and accessory to experimental engineering.

The Hydraulic Laboratory is supplied with about 700 feet of 8-inch and 10-inch cast iron pipe from the College elevated tank, of 163,000 gallons capacity. The available head is about 150 feet. In the laboratory a tank is provided 50 feet long by 6 feet wide by 4 feet deep, which is used as a measuring and discharging tank for various pieces of apparatus, and which can also be used for experiments on the resistance of models to propulsion. The water is removed from this tank by two sewers; one 6 inches and the other 15 inches in diameter. These are arranged to be used for experiments on the laws of flow in sewer pipes. The laboratory is also provided with pipes of different sizes so arranged that measurements of the friction losses in these pipes and in their fittings can be made. Additional apparatus in the nature of hydraulic motors, pumps of various types, and apparatus for experiments with orifices is being provided.

Locomotive. The Chicago & Northwestern railway has presented to the department an eight-wheel passenger locomotive and tender complete with attachments. The locomotive will be mounted for experimental work and will be a valuable addition to the laboratory equipment.

The principal dimensions of the locomotive are as follows:

Cylinder, 16x24 inches.

Drivers, diameter, 63 inches.

Driving wheel base, 7 feet, 3 inches.

Total engine wheel base, 21 feet, 3 inches.

Total engine and tender wheel base, 42 feet, 3 inches.

Total weight of engine, 70,000 pounds.

Weight on drivers, 40,000 pounds.

The estate of S. H. Mallory, of Chariton, Iowa, has presented a narrow gauge locomotive, one of the first in service on the mountain roads of Colorado. The valve mechanism is of the Waelschert type and the drivers and leading wheels are on a truck with the cylinders entirely separate from the boilers.

This engine is a very interesting machine and will be the nucleus for a museum of railway mechanical engineering.

Class Room Work.

In the class room the work is carried on by means of recitations and lectures, a text book and recitation being used wherever practicable; it is necessary, however, to present much material not found in text books, and in such cases recourse is had to the lecture system The projective lantern is freely used in illustrating subjects presented by lecture.

Inspection Trips.

Once each year or oftener visits of inspection are made by the Senior class to power and manufacturing plants in Chicago and other large centers.

Non-Resident Lecturers.

Lectures by men in active engineering work are introduced from time to time and serve to add interest to the College work by bringing students and teachers in contact with the professional engineer and the problems of modern engineering.

Thesis.

So far as possible the graduating thesis is directed along lines which will produce results directly useful to the industrial interests of the State of Iowa, but this object is not furthered to the detriment of the student to whom the thesis must be first of all an opportunity to think for himself and to apply principles previously inculcated in the regular course of his studies.

Fees.

All students taking the shop work or engineering laboratory are required to pay a fee to defray the cost of materials, power, and breakage. The amount is specified in the description of the courses of study.

Mechanical Engineering at Ames and Throughout the State.

It is the desire of the department to be of all possible service to owners and operators of power stations for heat, light and power, of machine shops and of manufacturing plants in all lines.

To this end correspondence is invited relating to problems on mechanical engineering lines and whenever inquiries by letter or in person indicate a need for investigation demanding the technical skill and equipment of the department the same will be undertaken if possible and the results furnished to all interested.

COURSES IN MECHANICAL ENGINEERING.

Four Year Course in Mechanical Engineering.

This course leads to the degree of Bachelor of Science in Mechanical Engineering. Graduates from this course may receive the full professional degree of Mechanical Engineer by devoting one year to resident study and one year to a responsible engineering position and presentation of a satisfactory thesis, or by five years' service in responsible engineering work and presentation of thesis.

N. B. Engineering Course numbers. The number in hundreds place indicates the semester in which the subject is taught. If the subject is also taught in a previous semester, the true course number is followed by the descriptive course number in parenthesis.

Academic Year.

Any student who at entrance presents satisfactory credit for part of the Academic Course, or who by examination passes part of it satisfactorily, will be classified in such of the remaining work offered in the Academic year as the Dean of the Junior College and the Dean of Engineering shall consider will best prepare him for his college course. After providing in such classification for the remainder of the thirty credits required for entrance to college, the student may complete his schedule by taking up some of the Freshman studies.

A SEMESTER.

			Required semester hours
Mathematics 3	Algebra		5
English 2	Rhetoric and Composition		5
Modern Languages			
Language selected must be carried through the entire year.			
Choice: Language 1,	French	5	5
Choice: Language 5,	German	5	
Choice: Language 30,	Spanish	5	
Civics 1	Government in State and Nation		2
Mechanical Engineering A 19,	Perspective Drawing		1
	Total semester hours		18

B SEMESTER.

			Required semester hours
Mathematics 5,	Plane Geometry		3
Mathematics 6,	Solid Geometry		2
Literature 12,	English Classics		4
Modern Languages			
Language selected must be a continuation of the one chosen in first semester.			
Choice: Language 2,	French	5	5
Choice: Language 6,	German	5	
Choice: Language 31,	Spanish	5	
History 16,	The National Period		3
Mechanical Engineering B 29,	Joinery and Wood Turning		1
	Total semester hours		18

*Freshman Year.

FIRST SEMESTER.

		Required semester hours
Mathematics 20	Algebra	4
Mathematics 21,	Plane Trigonometry	1
Modern Languages		
Language selected must be carried through the entire year.		

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*Freshmen who show deficient preparation in English or Mathematics may be assigned by the Dean of the Junior College and the Dean of Engineering, to special classes, with one credit hour more work than indicated above, or in case of clear indication of failure, even with this arrangement, they may be assigned to Academic classes.

Choice	Language 18 or 57,	French 3	3
	Language 20 or 73,	German 3	
	Language 36 or 45,	Spanish 3	
	English 10,	Narration and Description	3
	Chemistry 41,	General Chemistry	3
	Mechanical Engineering 130,	Shop Work	2
	Mechanical Engineering 117,	Technical Lecture	
	Mechanical Engineering 121,	Mechanical Drawing	2
	Military 1,	Military Drill	
		Total semester hours	18

SECOND SEMESTER.

			Required semester hours
	Mathematics 22,	Trigonometry	2
	Mathematics 23,	Analytical Geometry	3
	Modern Languages		

Language selected must be a continuation of the one chosen in first semester.

Choice	Language 19 or 58,	French 3	3
	Language 21 or 74,	German 3	
	Language 37 or 46,	Spanish 3	
	English 11,	Exposition	3
	Chemistry 42,	General Chemistry	3
	Mechanical Engineering 232,	Shop Work	2
	Mechanical Engineering 218,	Technical Lecture	
	Mechanical Engineering 220,	Descriptive Geometry	2
	Military 2,	Military Drill	
		Total semester hours	18

Sophomore Year.

THIRD SEMESTER.

		Required semester hours
Mathematics 24,	Analytical Geometry	2
Mathematics 25,	Calculus	3
English 12,	Argumentation	2
Chemistry 43,	Qualitative Chemistry	3
Physics 303,	Mechanics and Heat	5
Mechanical Engineering 331,	Shop Work	2
Mechanical Engineering 322,	Mechanical Drawing	1
Military 3, or Athletics		
	Total semester hours	18

History 17,	The American People	1

To be taken in Sophomore or Junior year.

FOURTH SEMESTER.

		Required semester hours
Mathematics 26,	Differential and Integral Calculus	4
Chemistry 45,	Analytical Chemistry	2
Physics 404,	Electricity and Magnetism and Light and Sound	5
Mechanical Engineering 401,	Analytical Mechanics	3
Mechanical Engineering 437,	Shop Work	1
Mechanical Engineering 439,	Shop Work	1
Mechanical Engineering 423,	Mechanical Drawing	2
Military 4, or Athletics		
	Total semester hours	18
History 18,	American Statesmen	1

To be taken in Sophomore or Junior year.

Junior Year.

FIFTH SEMESTER.

		Required semester hours
Mechanical Engineering 502,	Analytical Mechanics	5
Mechanical Engineering 503,	Materials of Construction	3
Mechanical Engineering 541,	Descriptive Engineering	2
Physics 506,	Electricity and Magnetism	3
Mechanical Engineering 524,	Valve Gear Design	1
Mechanical Engineering 512,	Mechanical Engineering Laboratory	1
Mechanical Engineering 533,	Shop Work	2
Physics 523,	Physical Laboratory	1
	Total semester hours	18

SIXTH SEMESTER.

		Required semester hours
Mechanical Engineering 606,	Analytical Mechanics	5
Mechanical Engineering 605,	Machine Design	3
Engineering 603,	Conservation of Natural Resources	1
Mechanical Engineering 642,	Descriptive Engineering	1

Electrical Engineering 610,	Direct Current Machinery	3
Mechanical Engineering 625,	Boiler Design	1
Mechanical Engineering 634,	Shop Work	2
Mechaniial Engineering 613,	Mechanical Engineering Laboratory	1
Physics 615,	Physical Laboratory	1
	Total semester hours	18

Optional:

Students obtaining approval of the head of the department may classify, during any semester of the Junior or Senior years, in two hours of optional culture work.

Senior Year.

SEVENTH SEMESTER.

For students graduating in 1910 and later. For course of study of graduates of 1909 see Catalog for 1907-1908.

		Required semester hours
Engineering 702,	Specifications and Contracts	1
Mechanical Engineering 704,	Heat Engines	3
Mechanical Engineering 708,	Railway Mechanical Engineering	3
Mechanical Engineering 707,	Heating and Ventilation	2
Economic Science 9,	Outlines of Economics	3
Mechanical Engineering 726,	Designing	2
Mechanical Engineering 735,	Shop Work	2
Mechanical Engineering 714,	Mechanical Engineering Laboratory	1
Electrical Engineering 717,	Electrical Engineering Laboratory	1
Mechanical Engineering 743,	Mechanical Engineering Seminar	
Mechanical Engineering	Thesis begun	
	Total semester hours	18

EIGHTH SEMESTER.

		Required semester hours
Engineering 801,	History of Engineering	1
Mechanical Engineering 809,	Constructive Engineering	3
Civil Engineering 855,	Water Supply Engineering	2
Electrical Engineering 815,	Alternating Current Machinery	3
Mechanical Engineering 827,	Designing	3
Mechanical Engineering 811,	Thesis	4

Mechanical Engineering 815,	Mechanical Engineering Laboratory	1
Electrical Engineering 818,	Electrical Engineering Laboratory	1
Mechanical Engineering 844,	Mechanical Engineering Seminar	
	Total semester hours	18

Optional:

Students obtaining approval of the head of the department may classify, during any semester of the Junior or Senior years, in two hours of optional culture work.

Five Year Course in Mechanical Engineering.

The following five year course in Mechanical Engineering is offered in response to a demand for an engineering course giving the student a better education in the culture studies and the natural sciences together with an opportunity to specialize along certain engineering lines not possible in the time available in the four year course of study. The course includes all of the work given in the four year course and in addition twenty-four hours of culture and scientific studies, together with ten hours of work given in the engineering departments.

This course leads to the same degree granted to graduates of the four year course, but a graduate may obtain the full professional degree of Mechanical Engineer after one year of responsible professional work and the presentation of a satisfactory thesis.

N. B. Engineering Course Numbers.—The number in hundreds place indicates the semester in which the subject is taught. If the subject is also taught in a previous semester, the true course number is followed by the descriptive course number in parenthesis.

Freshman Year.

FIRST SEMESTER.

	Mathematics 20	Algebra	4
	Mathematics 21	Plane Trigonometry	1
	Modern Language		
	Language selected must be carried through the entire year.		
Choice	Language 18 or 57	French 3	
	Language 20 or 73,	German 3	3
	Language 36 or 45,	Spanish 3	
	English 10	Narration and Description	3
	History 6	French Revolution and XIXth Century	3
	Mechanical Engineering 121	Mechanical Drawing	2
	Mechanical Engineering 130	Forge Work	2
	Mechanical Engineering 117	Technical Lecture	
	Military 1	Drill	
			18

SECOND SEMESTER.

Mathematics 22	Trigonometry	2
Mathematics 23	Analytical Geometry	3
Modern Language		
Language selected must be a continuation of the one chosen in the first semester.		
Choice: Language 19 or 58,	French 3	3
Language 21 or 74,	German 3	
Language 37 or 46,	Spanish 3	
English 11	Exposition	3
History 4	Division and Reunion, 1850 to 1879	3
Mechanical Engineering 220	Descriptive Geometry	2
Mechanical Engineering 232	Foundry	2
Mechanical Engineering 218	Technical Lecture	
Military 2	Drill	
		18

Sophomore Year.

THIRD SEMESTER.

Mathematics 24	Analytical Geometry	2
Mathematics 25	Calculus	3
English 12	Argumentation	2
Chemistry 2	General Chemistry	5
Mechanical Engineering 322	Mechanical Drawing	1
Mechanical Engineering 331	Pattern Work	2
History 17	The American People	1
Elective:	Non-technical work	2
Military 3, or Athletics		
		18

FOURTH SEMESTER.

Mathematics 26	Differential and Integral Calculus	4
Chemistry 5	Qualitative Analysis	5
Mechanical Engineering 423	Mechanical Drawing	2
Mechanical Engineering 437	Pattern work	1
Mechanical Engineering 439	Pipe Fitting	1
History 18	American Statesmen	1
Elective:	Non-technical work	4
Military 4, or Athletics		
		18

Junior Year.

FIFTH SEMESTER.

Physics 503 (303)	Mechanics and Heat	5
Mechanical Engineering 503	Materials of Construction	3
Economic Science 9	Outlines of Economics	3
Civil Engineering 545 (345)	Surveying	2
Mechanical Engineering 533	Machine work	2
Mechanical Engineering 524	Valve Gear Design	1
Mechanical Engineering 541	Descriptive Engineering	2
		18

SIXTH SEMESTER.

Physics 604 (404)	Electricity and Magnetism, Light and Sound	5
Mechanical Engineering 601 (401)	Analytical Mechanics	3
Economic Science 12	Engineering Economics	3
Civil Engineering 646 (446)	Surveying	2
Mechanical Engineering 634	Machine work	2
Mechanical Engineering 642	Descriptive Engineering	1
Elective:	Non-technical work	2
		18

Senior Year.

SEVENTH SEMESTER.

Mechanical Engineering 702 (502)	Analytical Mechanics	5
Physics 706 (506)	Electricity and Magnetism	3
Mechanical Engineering 707	Heating and Ventilating	2
Physics 723 (523)	Physical Laboratory	1
Mechanical Engineering 712 (512)	M. E. Laboratory	1
Mechanical Engineering 735	Machine work	2
Mechanical Engineering 726	Designing	2
Elective:	Non-technical work	2
		18

EIGHTH SEMESTER.

Engineering 803 (603)	Conservation of Natural Resources	1
Mechanical Engineering 806 (606)	Analytical Mechanics	5
Mechanical Engineering 805 (605)	Machine Design	3
Electrical Engineering 810 (610)	Direct Current Machinery	3
Physics 815 (615)	Physical Laboratory	1
Mechanical Engineering 813 (613)	M. E. Laboratory	1
Mechanical Engineering 825 (625)	Boiler Design	1
Elective:	Non-technical work	3
		18

Post Senior Year.

NINTH SEMESTER.

Engineering 902 (702)	Specifications and Contracts	1
Mechanical Engineering 904 (704)	Heat Engines	3
Mechanical Engineering 908 (708)	Railway Mechanical Engineering	3
Civil Engineering 921 (721)	Sanitary Engineering	3
Mechanical Engineering 914 (714)	M. E. Laboratory	1
Electrical Engineering 920 (720)	E. E. Laboratory	2
Mechanical Engineering	Thesis begun	
Elective:		5
		18

TENTH SEMESTER.

Engineering 1001 (801)	History of Engineering	1
Mechanical Engineering 1009 (809)	Constructive Engineering	3
Civil Engineering 1055 (855)	Water Supply Engineering	2
Electrical Engineering 1015 (815)	Alternating Current Machinery	3
Electrical Engineering 1018 (818)	E. E. Laboratory	1

Mechanical Engineering 1027 (827)	Designing	3
Mechanical Engineering 1015 (815)	M. E. Laboratory	1
Mechanical Engineering 1011 (811)	Thesis	4
		18

COURSES IN MECHANICAL ENGINEERING.

N. B. Engineering Course Numbers. The number or letter in hundreds place indicates the semester in which the subject is taught.

A19. Perspective Drawing. Mechanical and Electrical Engineering Courses. Use of pencil and pen in sketching and linear perspective. One hour credit. Four hours per week.

B29. Joinery and Wood Turning. Mechanical and Electrical Engineering Courses. Manual training in bench and lathe work in wood. One hour credit. Four hours per week. Fee, $3.00.

117. Technical Lecture. Mechanical Engineering Course. Study of elementary principles of construction and operation of steam engines, boilers and accessory apparatus. One lecture per week.

121. Mechanical Drawing. Mechanical, Electrical and Mining Engineering and Ceramic Courses and first semester two year courses in Mining Engineering and Clay Working. Use of drawing instruments, practice in lettering, and making working drawings. Two hours credit. Six hours per week.

130. Shop Work. Mechanical, Electrical and Mining Engineering and Ceramic Courses and first semester two year courses in Mining Engineering and Clay Working. Forge work, forging and welding iron and steel, and dressing and tempering tools. Two hours credit. Six hours per week. Fee, $5.00.

181. Mechanical Drawing. Civil and Agricultural Engineering Courses. The use of drawing instruments, making of working drawings. One hour credit. Three hours per week.

218. Technical Lecture. Mechanical Engineering Course in connection with required shop work. Study of shop methods, tools and appliances. One lecture per week.

220. Descriptive Geometry. Mechanical, Electrical, Mining and Agricultural Engineering and Ceramic Courses. Study of the principles of projection of the point, line, and plane, the basis of all mechanical drawing. The principles are illustrated and fixed in mind by the solution of numerous familiar examples to show the practical application of the subject. Prerequisites, 121 and 181. Two hours credit. Five hours drawing and one lecture per week.

232. Shop Work. Mechanical and Electrical Engineering Courses. Foundry Work, moulding in green and dry sand and cores, casting in iron, brass, mixtures and alloys. Two hours credit. Six hours per week. Fee, $5.00.

322. Mechanical Drawing. Mechanical, Electrical, Mining and Agricultural Engineering and Ceramics Courses. Machine Sketching and Detailing. Prerequisites, courses 121 and 220. One hour credit. Three hours per week.

331. Shop Work. Mechanical, Electrical, Mining Engineering and Ceramics Courses, and in the Two Year courses in Mining and Clay Working. Pattern work, principles of Joinery, Wood Turning and Carving as applied to the making of simple patterns and core boxes for iron, brass and aluminum castings. Two hours credit. Six hours per week. Fee, $5.00.

401. Analytical Mechanics. All Engineering and Agricultural Engineering Courses. Statics, graphics and strength of materials. Text book, Mechanics of Engineering, Church. Prerequisites, Mathematics 25. Three recitations per week.

423. Mechanical Drawing. Mechanical and Electrical Engineering and Ceramics Courses, and in Two Year courses in Mining Engineering and Clay Working. Working drawings, tracings, blue prints of complete machines and their details. Prerequisite, Course 322. Two hours credit. Six hours per week.

437. Shop Work. Mechanical and Electrical Engineering Courses. Advanced pattern making, gearing, sweep and moulding machine work. One hour credit. Three hours per week. Fee, $2.00.

439. Shop Work. Mechanical and Electrical Engineering Courses. Steam fitting and plumbing, cutting and making up threaded, flanged and leaded joints with standard fittings. One hour credit. Three hours per week. Fee, $3.00.

483. Mechanical Drawing. Mining Engineering and Ceramic Courses. Of same character as course 423. Prerequisite, 322. One hour credit. Three hours per week.

502. Analytical Mechanics. All Engineering and Agricultural Engineering Courses. Flexure and dynamics. Text book same as in course 401, which is a prerequisite. Recitations, five hours per week.

503. Materials of Construction. Mechanical and Electrical Engineering and Ceramic Courses. Manufacture, properties, and uses of iron, steel, wood, cement, etc. Text book, Materials of Construction, Johnson. Prerequisite, Chemistry 5 or 45. Recitations, three hours per week.

512. Laboratory. Mechanical, Electrical, Mining and Agricultural Engineering Courses. Properties of materials, calibration of instruments, valve setting, indicator practice and efficiency tests of simple machines. Reference book, Experimental Engineering, Carpenter. Prerequisites, 401 and Chemistry 5 and 42. One hour credit. One half day per week. Fee, $3.00.

524. Valve Gear Design. Mechanical Engineering Course. Kinematics and valve gear design. One hour credit. Three hours draughting and lecture per week.

533. Shop Work. Mechanical and Electrical Engineering Courses. Use of hand and machine tools for working iron, steel and brass, finishing and assembling of machines and parts thereof. Prerequisite, course 130. Two hours credit. Six hours per week. Fee, $5.00.

541. Descriptive Engineering. Mechanical Engineering Courses. Study and written reports on engineering processes, methods and current engineering construction. References; magazines, journals and proceedings of engineering societies. Two hours per week.

605. Machine Design. Mechanical Engineering Course. Elements of Machine Design. Text book, Machine Design, Smith and Marx. Prerequisites, courses 502, 503 and 512. Recitations, three hours per week.

606. Analytical Mechanics. Mechanical and Agricultural Engineering Courses. Work, energy and power, plain and reinforced concrete and hydraulics. Prerequisites, 502 and 503. Recitations, five hours per week.

613. Laboratory. Mechanical, Electrical and Agricultural Engineering and Ceramic Courses. Continuation of course 512. One hour credit. One half day per week. Fee, $3.00.

625. Designing. Mechanical Engineering Course. Design of steam boilers, also study of form, strength and proportions of the frames and moving parts of cranes and other machines, with detail drawings of the same. Reference books, Steam Boilers, Peabody and Miller; Handbook of Information, Cambria Steel Co. Prerequisites, 423, 502 and 512. One hour credit. Three hours per week.

634. Shop Work. Mechanical Engineering Course. Course 533 continued. Two hours credit. Six hours per week. Fee, $5.00.

642. Descriptive Engineering. Mechanical Engineering Course. Course 541 continued. One hour per week.

686. Analytical Mechanics. Civil, Electrical and Mining Engineering and Ceramic Courses. Work, Energy and Power and Hydraulics. Prerequisite, course 502. Recitations, four hours per week.

689. Machine Design. Electrical Engineering Course. Elements of Machine Design. Text book, Machine Design, Smith and Marx. Prerequisites, 502, 503 and 512. Recitations, two hours per week.

704. **Heat Engines.** Mechanical Engineering Course. Theory and practical application thereof to the steam engine and other heat engines. Text book, Thermodynamics of Heat Engines, Reeve. Prerequisites, course 512, Physics 303, and Mathematics 26. Recitations or lectures, three hours per week.

707. **Heating and Ventilation.** Mechanical Engineering Course. Study of modern methods for heating and ventilation. Prerequisite, Physics 303 and simultaneous work in M. E. 726. Recitations or lectures, two hours per week.

708. **Railway Mechanical Engineering.** Mechanical Engineering Course. Construction and operation of Railway Machinery. Prerequisites, courses 605, 613 and 625. Recitations or lectures, three hours per week.

714. **Laboratory.** Mechanical and Agricultural Engineering Courses. Efficiency tests of steam, gas, gasoline and hot air engines, boilers, refrigerating machinery and complete plants. Prerequisites, course 613 and simultaneous work in 704. One hour credit. Four hours per week. Fee, $3.00.

726. **Designing.** Mechanical Engineering Course. Computation and design of heating and ventilating plants, tools and machinery. Prerequisites, courses 605 and 625 and simultaneous work in 707. Two hours credit. Six hours per week.

735. **Shop Work.** Mechanical Engineering Course. Advanced machine work, milling, grinding, fitting and assembling. Prerequisite, course 634. Two hours credit. Six hours per week. Fee, $5.00.

743. **Seminar.** Mechanical Engineering Course. Written papers and discussions of assigned topics. One meeting per week.

784. **Steam Engines and Boilers.** Civil, Electrical, and Mining Engineering and Ceramic Courses. Construction, operation and maintenance of standard types of steam engines and boilers. Two lectures or recitations per week.

788. **Railway Mechanical Engineering.** Civil Engineering Course. Construction and operation of railway machinery. Simultaneous work in 784 required. Recitations and lectures, two hours per week.

809. **Constructive Engineering.** Mechanical, Electrical, and Mining Engineering and Ceramic Courses. Principles of design and construction of heating, refrigerating, power, lighting and pumping plants in general and detail. Prerequisites, courses 512, 704 and 784. Lectures, three hours per week.

811. **Thesis.** Mechanical Engineering Course. This course is de-

voted to special work on an approved topic to be selected before the end of the first semester of the Senior year. Taken by those students of the Mechanical Engineering Department who have completed the work of the Junior year. Expenses of the thesis are adjusted by special arrangement in each case. Equivalent to four hours per week.

815. Laboratory. Mechanical Engineering Course. Continuation of course 714. One hour credit. Four hours per week. Fee, $3.00.

827. Designing. Mechanical Engineering Course. Design of steam engine, selection of engines, boilers and auxiliaries, arrangement of machinery, and design of piping for steam power plant. Prerequisites, completion of work of Junior year and simultaneous work in 809. Three hours credit. Nine hours designing and lecture.

844. Seminar. Mechanical Engineering Course. Written papers and discussions of assigned topics. One meeting per week.

SUBJECT GROUPS IN MECHANICAL ENGINEERING.

The following is a summary of the lines of work given in the Mechanical Engineering Department.

Applied Mechanics and Hydraulics.

401 Analytical Mechanics
502 Analytical Mechanics
503 Materials of Construction
512 Laboratory
605 Machine Design
606 Analytical Mechanics
613 Laboratory
686 Analytical Mechanics

Steam and Power Engineering.

625 Designing
704 Heat Engines
707 Heating and Ventilation
708 Railway Mechanical Engineering
714 Laboratory
726 Designing
784 Steam Engines and Boilers
788 Railway Mechanical Engineering
809 Constructive Engineering
811 Thesis
815 Laboratory
827 Designing

Machine Construction.

a29 Joinery and Wood Turning
117 Technical Lecture
130 Shop Work
218 Technical Lecture
232 Shop Work
331 Shop Work
437 Shop Work
439 Shop Work
533 Shop Work
634 Shop Work
735 Shop Work

Drawing and Design.

a19 Perspective Drawing
121 Mechanical Drawing
181 Mechanical Drawing

322 Mechanical Drawing
423 Mechanical Drawing

483 Mechanical Drawing
524 Valve Gear Design
605 Machine Designing
625 Designing
726 Designing
827 Designing

Experimental Engineering.

512 Laboratory
613 Laboratory

714 Laboratory
815 Laboratory

Engineering Literature and Reports.

541 Descriptive Engineering
642 Descriptive Engineering
743 Seminar

811 Thesis
844 Seminar

DEPARTMENT OF CIVIL ENGINEERING.

A. MARSTON, PROFESSOR.
C. B. STANTON AND J. E. KIRKHAM, ASSOCIATE PROFESSORS.
H. C. FORD AND M. I. EVINGER, ASSISTANT PROFESSORS.
T. H. MACDONALD, ASSISTANT PROFESSOR IN CHARGE OF ROAD INVESTIGATIONS.
R. W. CRUM AND D. B. WHEELER, INSTRUCTORS.
RAY WEIRICK, STUDENT ASSISTANT.

The Department of Civil Engineering has its headquarters in Engineering Hall. The offices of the department occupy rooms 311, 315, and 316 in the third story of the building. In addition, the Department has two large class-rooms and a large drawing room in the third story, a drawing room 40 feet by 70 feet, and a large office room in the fourth story, besides a cement laboratory and a masonry laboratory in the first story. The Department also has the use, in common with the other Engineering Departments, of the photographic and blue print rooms in the fourth story, the large Engineering Museum and Library in the third story, and the large Assembly Room in the second story. All of these rooms are finely furnished and equipped throughout.

In connection with the offices provision is made for the systematizing of all the work of the Department, and card indexes for correspondence, equipment, and for general engineering literature are provided.

In addition to the space occupied in Engineering Hall, part of the equipment of the Department is placed in the Structural and Hydraulic Laboratory. Here are located one drawing room, one recitation room, one instrument room, and two offices, all occupied by the surveying department. There is also located here the Hydraulic Laboratory, and most of the apparatus for testing the materials of construction. In these two lines of work the Departments of Civil Engineering and Mechanical Engineering co-operate.

The Instrumental Surveying Equipment is nearly all kept in room 15 on the third floor of the Structural and Hydraulic Laboratory, where suitable cases and racks are provided for storing it in a systematic way. The instrumental equipment includes fifteen engineer's transits, one plain transit, one astronomical transit, one 7-inch altazimuth, one plane table, one surveyor's compass, one railroad compass, one solar compass, six traverse tables, twelve engineer's levels, and numerous chains, tapes, chaining pins, range-poles, level rods, stadia rods, axes, etc. The Department is also well supplied with minor instruments, such as drawing instruments, clinometers, computing machines, planimeter, hand levels, etc. This equipment is being constantly added to from yearly appropriations.

In giving out the instruments for the field work in the Civil Engineering Course the captain of each field party signs a receipt for all apparatus taken out, and upon return of the same these receipts are canceled and kept on file. Students are required to return all apparatus in as good condition as when taken out.

The Cement Laboratory is located in the first story of Engineering Hall, occupying room 105. Stone topped tables are provided on three sides of this room on which the mixing and breaking of briquettes and similar work is done. On two sides of the room are provided tanks underneath these tables for the storing of briquettes. Investigations are constantly under way with cements and similar substances, so that ample storage room is required. Under the stone topped table on the other side of the room are provided cement bins for storage of cement and standard sand.

A Fairbanks testing machine is used for breaking the briquettes. There is an ample supply of molds for making the briquettes and the usual apparatus is provided for testing soundness, fineness, and rate of setting.

The Roads and Paving and Masonry Laboratory occupies room 106 of the first floor. This room is intended for the testing of materials for roads, and pavements, and for building materials, especially brick and stone. Laboratory tables are provided for the microscopic work and other work in this line. Grinding apparatus is arranged for preparing specimens for crushing and other tests.

This laboratory also contains the abrasion testing machine, the rattler for tests of road materials, the machines for cementation tests of wood materials, a small ball mill, rock crusher and grinder. Apparatus for testing materials of asphalt pavements is also located in this room, inside a glass inclosure. All the apparatus in this laboratory is operated from shafting driven by an electric motor in a separate inclosure.

The Hydraulic Laboratory is located in the basement and first story of the Structural and Hydraulic Laboratory. The basement is lined with enamelled brick. In the floor above is a large railed opening to the basement occupying about one-third of the floor space. The floors and columns are of reinforced concrete. Water is supplied by about 700 feet of 8 inch and 10 inch cast iron pipe from the college elevated tank of 163,000 gallons capacity. The available head is about 150 feet.

To supply water at perfectly uniform pressure and at different moderate heads for experimental work, a steel stand pipe is provided, thirty inches in diameter by 40 feet high.

The waste water from all the apparatus discharges into a tank six feet wide by four feet deep by fifty feet long, located in the floor of the basement.

The water is removed from this tank by two sewers, one 6 inches and the other 15 inches in diameter. These are arranged to be used in experiments on the laws of flow in sewer pipes. The laboratory is also provided with wrought iron pipes of different sizes, so arranged that measurements of friction losses in these pipes and in their fittings can be made. Additional apparatus in the nature of weirs, hydraulic motors and pumps of various types is provided.

Structural Laboratory Facilities for other tests of the materials of construction are provided in connection with the Mechanical Engineering Department in the same building. A 100,000 lbs. tension and compression machine, a 100,000 lbs. transverse machine, a 50,000 lbs. tension and compression machine, a torsion testing machine, a 20,000 lbs. wire testing machine, and other apparatus are provided. Two large laboratory rooms, for computations, instrument rooms, and offices are provided.

Standard Engineering Plans.—The Department has a large collection of blue prints of bridges, roof trusses, buildings and similar structures, which have been kindly donated by the principal corporations engaged in structural engineering throughout the country. In a similar way, the principal railway companies of the country have donated standard plans of railway structures; and many plans and specifications of water works, sewer systems, and other engineering works are also to be found in the Department's collection of standard plans. This collection is constantly being added to. It is arranged systematically in large drawers, in filing cases provided in connection with the office equipment. In the general arrangement, plans relating to the same subject are kept in the same drawer. In addition, a card index is provided whereby any drawing in the collection can readily be found.

The Engineering Museum and Library Room on the third floor of the new Engineering Hall, 60 feet in diameter, is intended for the joint use of all the Departments of Engineering. This room is completely supplied with museum cases, and space is provided in which will be placed large models of engineering structures. The collection of specimens for this Museum is just beginning, but the Civil Engineering Department has already a set of the full sized sections of wrought iron and steel commonly used in engineering structures and a collection of specimens of Iowa building brick, paving brick, building stone, and other building materials. The Museum collection will be extended as rapidly as possible. The engineering library is located in this room.

Water Works and Sewage Disposal Plant.—The Civil Engineering Department designed and supervised the construction of the college water-works. The College water tower is the largest in the state. It was designed with special reference to its architectural appearance and cuts of it have been published in four of the books treating of the design of such structures. The pumping machinery is so arranged that college students can readily make tests of the efficiency of the apparatus as part of the class work.

The Civil Engineering Department has also designed and supervised the construction of the College sewage disposal system. This is the first purification plant installed in the state and has been very successful.

The water works system and sewage disposal plant are utilized, so far as possible, to furnish practical object lessons to the students in Hydraulic and Sanitary Engineering.

For many years the Civil Engineering Department has been engaged in conducting various investigations helpful to the industrial interests of Iowa, and the results have been made available in numerous publications. This work is now merged in that of the Engineering Experiment Station, described later in this catalogue.

The Alumni of the Department.—The Civil Engineering Department of the Iowa State College is proud of the record made by its Alumni, in all branches of Civil Engineering, as shown by their eminence as engineers. They are to be found located in responsible positions throughout the country and abroad. The Department maintains an Alumni Directory and endeavors to keep in touch, so far as possible, with its graduates. It is often the case that the Department is able to be helpful to the Alumni by recommending them for positions. The Department receives more and more calls for men to fill good positions. Many of these calls come from the older Alumni themselves.

The nature of the positions open to new graduates may be seen from those occupied by one class one year after graduation. Of this class eleven were engaged in railway engineering in the states of Iowa, Illinois, Nebraska, South Dakota, Idaho, New Mexico, Arizona and Washington; two were engaged in reinforced concrete work in Iowa and New York respectively; four were in Panama on the Panama canal work; one was employed on the Government Civil Engineering work in the Philippine Islands; two were employed with consulting engineers in general engineering practice in Texas and New York respectively; four were employed in irrigation engineering work in Wyoming, Montana, and California; four were employed in structural engineering work in

St. Louis, Chicago, and Ambridge, Penn.; one was engaged in water works construction in Iowa, and one was an instructor at the Iowa State College. The salaries of these men ranged up to $125 per month.

During the year we usually have calls considerably exceeding the total number of the graduating class to fill good positions.

Civil Engineering Course of Study.—This course includes a very careful study of English, Modern Language, either French, German or Spanish, History, Civics, and Economic Science, pure and applied Mathematics, Physics, Geology and Chemistry, together with the professional studies in Civil Engineering.

For detailed information as to the nature of the **professional work given in the course of Civil Engineering**, the reader is referred to the statements regarding each specific subject under the head of "Courses" below. It may be said here in a general way that the instruction in Free-Hand Drawing begins in the Academic Course. Mechanical Drawing, Lettering, the use of Water Colors and Pen Topography are studied in the Sophomore year. In the course of instruction in Drawing it is attempted to give the student such facility in drawing that he can do creditable work in an engineering draughting office. Especial attention is paid to Lettering in the finishing up of all other drawings made in connection with his other professional work. The student is required to letter them plainly and neatly and to make finished plates. Throughout the Sophomore, Junior and Senior years the student has practice in the preparation of maps and of drawings and plans of various engineering structures.

The work in Field Surveying practice begins in the Freshman year and continues for three years, six hours per week, with the exception of the second term of the Freshman year, when only three hours are devoted to Field practice. The student becomes familiar with the various instruments and methods by actually using them. Starting with the simplest problems,—pacing, ranging, and chaining, he gradually works up to the use of the transit, level, and others of greater accuracy and delicacy. He becomes familiar with land surveying, leveling, topographical surveying and railroad surveying by actual work in the field. It is the aim of the course to give the student the facility in the handling of instruments and in the carrying out of operations in field surveying which can only be acquired by considerable practice. It is also attempted to give him as much experience as possible in the handling of small parties of men. Besides the above work students actually camp in the field for two weeks in each of three summer vacations, and so become familiar with topographical work on a more extended scale. In lieu of this summer surveying many students obtain remunerative work with engineers throughout the summer vacation. Such work, when properly certified to by the engineer under whom it is taken, is accepted in lieu of the summer camp surveying. Students are encouraged and urged to secure positions of this kind, as it not only assists them financially, but also is of great benefit to them in connection with their professional training.

A course of instruction in Land, Topographical, City and Mining Surveying, and Drainage Engineering, runs throughout the Sophomore year and one in Railway Engineering runs throughout the Junior year.

Electric Railways and Power Transmission are also studied in the Junior year.

Instruction in Roads and Pavements is given in the first semester of the Senior year. Sanitary Engineering, Water Works Engineering, Bridge Engineering, and Masonry Structures and Foundations are taught in the Senior year. For the details of each of these courses reference should be made to the information given below under the specific course named. The designing of engineering structures by the student begins in the second semester of the Junior year and continues throughout the Senior year. In this work the student actually designs roof trusses and stone and steel truss bridges, preparing the working drawings. A course of actual practice in testing the various materials of construction in the Engineering Laboratory is given in the Junior and Senior years, and is of great value in familiarizing the student with methods of testing and with the properties of the materials of construction.

General instruction in engineering practice and in the spirit of the profession is given by courses of technical lectures in the Freshman and Sophomore years, and by Seminar work of the Junior and Senior years.

Besides the work as given in the outlined course of study, the student in Civil Engineering gains a large part of his experience and training by inspection of engineering work on the inspection tours arranged for the upper classmen. It is planned at least once a year to have the Senior students go on an inspection trip to some point where various engineering works can be inspected and their instructive features noted. Trips are made to Chicago, St. Paul, St. Louis, and other places.

Valuable instruction is also obtained by listening to lectures given y non-resident lecturers. Practicing engineers are invited to the College o give lectures to the engineering students upon the subjects in which hey are experts.

The work of the course finally culminates in the thesis, an original nvestigation carried on by the student to demonstrate his ability to lo such work before he graduates. In the past large amounts of time ave been devoted by students as a rule to this work, and it has often een the case that the results have been found worthy of publication. Each student should attempt to make his thesis one of the things of hich he can justly be proud throughout the remainder of his professional areer.

COURSES IN CIVIL ENGINEERING.

Academic Year.

Any student who at entrance presents satisfactory credit for part of the Academic Course, or who by examination passes part of it satisfactorily, will be classified in such of the remaining work offered in the Academic year as the Dean of the Junior College and the Dean of Engineering shall consider will best prepare him for his college course. After providing in such classification for the remainder of the thirty credits required for entrance to college, the student may complete his schedule by taking up some of the Freshman studies.

A SEMESTER.

		Required semester hours
Mathematics 3	Algebra Review	5
English 2	Rhetoric and Composition	5
Modern Languages		

The Language selected must be carried through the entire year.

Choice Language 1 Language 5 Language 30	French 5 German 5 Spanish 5	5
Civics 1	Government in State and Nation	2
Civil Engineering A47	Field Work	1
	Total semester hours	18

B SEMESTER.

		Required semester hours
Mathematics 5	Plane Geometry	3
Mathematics 6	Solid Geometry	2
Literature 12,	English Classics	4
Modern Languages		

The Language selected must be a continuation of the one chosen in the first semester.

Choice Language 2 Language 6 Language 31	French 5 German 5 Spanish 5	5
History 16	The National Period	3
Civil Engineering B48	Technical Drawing	1
	Total semester hours	18

FOUR YEAR COURSE IN CIVIL ENGINEERING.

The four year Civil Engineering Course, as given below, leads to the degree of Bachelor of Science in Civil Engineering. Graduates of this four year course can secure the advanced degree of Civil Engineering on the completion of five years of successful professional work and the presentation of a satisfactory thesis, or by taking one year of post graduate work at the College, completing one year of satisfactory professional work and presenting a satisfactory thesis.

N. B. ENGINEERING COURSE NUMBERS.—The number in hundreds place indicates the semester in which the subject is taught. If the subject is also taught in a previous semester, the true course number is followed by the descriptive course number in parenthesis.

**Freshman Year.

FIRST SEMESTER.

Mathematics 20	Algebra	4
Mathematics 21	Plane Trigonometry	1
Modern Languages		

The Language selected must be carried through the entire year.

Choice	Language 18 or 57	French 3	3
	Language 20 or 73	German 3	
	Language 36 or 45	Spanish 3	

English 10	Narration and Description	3
Chemistry 41	General Chimestry	3
Civil Engineering 102	Field Work	2
Civil Engineering 101	Civil Engineering Drawing	1
Mechanical Engineering 181	Mechanical Drawing	1
Civil Engineering 141	Technical Lecture	
Military 1	Military Drill	
	Total semester hours	18

SECOND SEMESTER.

		Required semester hours
Mathematics 22	Trigonometry	2
Mathematics 23	Analytical Geometry	3
Modern Languages		

**Freshmen who show deficient preparation in English or Mathematics may be assigned by the Dean of the Junior College and the Dean of Engineering, to special classes, with one credit hour more work than indicated above, or in case of clear indication of failure, even with this arrangement, they may be assigned to Academic classes.

The Language selected must be a continuation of the one chosen in the first semester.

Choice	Language 19 or 58	French 3	3
	Language 21 or 74	German 3	
	Language 37 or 46	Spanish 3	
	English 11	Exposition	3
	Chemistry 49	General Chemistry	4
	Civil Engineering 204	Descriptive Geometry	2
	Civil Engineering 203	Field Work	1
	Civil Engineering 242	Technical Lecture	
	Military 2	Military Drill	
	Civil Engineering 231	Summer Surveying	

All students in Civil Engineering go into camp fifteen days each summer vacation for surveying practice.

Total semester hours 18

Sophomore Year.

THIRD SEMESTER.

		Required semester hours
Mathematics 24	Analytical Geometry	2
Mathematics 25	Calculus	3
English 12	Argumentation	2
Physics 303	Mechanics and Heat	5
Civil Engineering 308	Surveying	4
Civil Engineering 349	Advanced Descriptive Geometry	1
Civil Engineering 305	Drawing	1
Civil Engineering 343	Technical Lecture	
Military 3, or Athletics		
	Total semester hours	18
History 17,	The American People	1

To be taken in Sophomore or Junior year.

FOURTH SEMESTER.

		Required semester hours
Mathematics 26	Differential and Integral Calculus	4
Physics 404	Electricity and Magnetism and Light and Sound	5
Mechanical Engineering 401	Analytical Mechanics	3
Civil Engineering 409	Surveying	4
Civil Engineering 450	Advanced Descriptive Geometry	1
Civil Engineering 407	Drawing	1

Civil Engineering 444	Technical Lecture	
Military 4, or Athletics		
Civil Engineering 432	Summer Surveying	

All students in Civil Engineering go into camp fifteen days each summer vacation for surveying practice.

	Total semester hours	18
History 18	American Statesmen	1

To be taken in Sophomore or Junior year.

Junior Year.

FIFTH SEMESTER.

		Required semester hours
Mechanical Engineering 502	Analytical Mechanics	5
Civil Engineering 510	Railway Engineering	5
Electrical Engineering 503	Electric Railways and Power Transmission	2
Physics 523	Physical Laboratory	1
Mathematics 27	Spherical Trigonometry	1½
Civil Engineering 524	Practical Astronomy and Geodesy	2½
Civil Engineering 514	Civil Engineering Laboratory	1
Civil Engineering 527	Civil Engineering Seminar	
	Total semester hours	18
Optional:		
History 7	America in the Far East	2
English 7	Debating	1
Literature 13	Literature	2
Civics 7	Comparative Government	2

SIXTH SEMESTER.

		Required semester hours
Mechanical Engineering 686	Analytical Mechanics	4
Civil Engineering 611	Railway Engineering	4
Civil Engineering 603	Conservation of Natural Resources	1
Civil Engineering 617	Structural Engineering	4
Civil Engineering 653	Materials of Construction	2
Economic Science 14	Outlines of Economics	2
Civil Engineering 615	Civil Engineering Laboratory	1
Civil Engineering 628	Civil Engineering Seminar	
Civil Engineering 633	Summer Surveying	
	Total semester hours	18

All students in Civil Engineering go into camp fifteen days each summer vacation and conduct an organized topographical survey. In place of the two weeks' summer surveying for any year there may be substituted not less than four weeks' actual engineering work done for some competent engineer, a reputable firm, or department engaged in engineering work, if certified by engineer under whom taken, on regular blank furnished by Department of Civil Engineering.

Optional:

History 9	Far Eastern Question	2
English 8	Debating	1
Literature 14	Literature	2
Civics 7	Comparative Government	2

Senior Year.

SEVENTH SEMESTER.

		Required semester hours
Civil Engineering 718	Structural Engineering	4
Civil Engineering 712	Roads and Pavements	2
Civil Engineering 723	Masonry and Foundations	2
Civil Engineering 721	Sanitary Engineering	3
Mechanical Engineering 784	Steam Engines and Boilers	2
Civil Engineering 716	Civil Engineering Laboratory	1
Civil Engineering 725	Thesis begun	
Civil Engineering 729	Seminar	
Engineering 702	Specifications and Contracts	1

Special Line of Work.

Each Senior Civil Engineer must elect one of the following special lines at the beginning of his Senior year and this election will govern throughout both Senior semesters.

Choice	Civil Engineering 738	Structural Engineering 3	3
	Mechanical Engineering 788, and Civil Engineering 754	Railway Mechanical Engineering 2 Signal Engineering 1	
	Civil Engineering 735	Irrigation Engineering 3	
		Total semester hours	18

Optional:

Economic Science 12	Engineering Economics	2
History 7	America in the Far East	2
Literature 13	Literature	2
Civics 7	Comparative Government	2
Botany 33	Technical Bacteriology	3

EIGHTH SEMESTER.

		Required semester hours
Civil Engineering 819	Structural Engineering	3
Civil Engineering 820	Arches and Reinforced Concrete	2
Civil Engineering 822	Water Supply Engineering	3
Geology 803	Engineering Geology	3
Civil Engineering 826	Thesis	3
Civil Engineering 830	Seminar	
Engineering 801	History of Engineering	1
Special Line of Work.		

The special line of work selected at the beginning of the Senior year must be continued through the semester.

Choice	Civil Engineering 839	Structural Engineering	3	3
	Civil Engineering 834	Railway Economics	3	
	Civil Engineering 836	Hydraulic Engineering	3	
		Total semester hours		18

Optional:

Economic Science 12	Engineering Economics	2
History 9	The Far Eastern Question	2
Literature 14	Literature	2
Civics 7	Comparative Government	2
Horticulture 17	Wood Technology	3
Chemistry 39	Water and Sewage Analysis	3

FIVE YEAR COURSE IN CIVIL ENGINEERING.

The Five Year Course in Civil Engineering includes all of the work of the four year course plus much general culture and elective culture and science work and some elective advance engineering work. All such engineers as can do so are urged to take this five year course instead of the four year course. It leads to the degree of Bachelor of Science in Civil Engineering as in the case of the four year course, but graduates of the five year course can secure the advance Civil Engineering degree on the completion of only one year of successful professional work and the presentation of a satisfactory thesis.

N. B. ENGINEERING COURSE NUMBERS.—The number in hundreds place indicates the semester in which the subject is taught. If the subject is also taught in a previous semester, the true course number is followed by the descriptive course number in parenthesis.

Freshman Year.

FIRST SEMESTER.

Mathematics 20	Algebra	4
Mathematics 21	Plane Trigonometry	1
Modern Language		

The Language selected must be carried through the entire year.

Choice	Language 18 or 57	French 3	3
	Language 20 or 73	German 3	
	Language 36 or 45	Spanish 3	
	English 10	Narration and Description	3
	History 6	French Revolution and XIX Century	3
	Civil Engineering 101	C. E. Drawing	1
	Mechanical Engineering 181	M. E. Drawing	1
	Civil Engineering 102	Field Work	2
	Civil Engineering 141	Technical Lecture	
	Military 1	Drill	
			18

SECOND SEMESTER.

Mathematics 22	Trigonometry	2
Mathematics 23	Analytical Geometry	3
Modern Language		

The Language selected must be a continuation of the one chosen in the first semester.

Choice	Language 19 or 58	French 3	3
	Language 21 or 74	German 3	
	Language 37 or 46	Spanish 3	
	English 11	Exposition	3
	History 4	Division and Reunion	3
	Civil Engineering 204	Descriptive Geometry	2
	Civil Engineering 203	Field Work	1
	Civil Engineering 206	C. E. Drawing	1
	Civil Engineering 242	Technical Lecture	
	Military 2	Drill	
	Civil Engineering 231	Summer Surveying	

All students in Civil Engineering go into camp fifteen days each summer vacation for surveying practice.

		18

Sophomore Year.

THIRD SEMESTER.

Mathematics 24	Analytical Geometry	2
Mathematics 25	Calculus	3
English 12	Argumentation	2
Chemistry 2	General Chemistry	5
Civil Engineering 308	Surveying	4

Civil Engineering 343	Technical Lecture	
Elective	Non-technical Work	2
Military 3, or Athletics		
		18

FOURTH SEMESTER.

Mathematics 26	Differential and Integral Calculus	4
English 13	Advanced Composition	2
Chemistry 5	Qualitative Analysis	5
Civil Engineering 409	Surveying	4
Civil Engineering 444	Technical Lecture	
Elective	Non-technical Work	3
Military 4, or Athletics		
Civil Engineering 432	Summer Surveying	

All students in Civil Engineering go into camp fifteen days each summer vacation for surveying practice.

18

Junior Year.

FIFTH SEMESTER.

Physics 503 (303)	Mechanics and Heat	5
Economic Science 9	Outlines of Economics	3
Mathematics 27	Spherical Trigonometry	1½
Civil Engineering 524	Practical Astronomy and Geodesy	2½
Civil Engineering 505 (305)	C. E. Drawing	1
Civil Engineering 549 (349)	Advanced Descriptive Geometry	1
Elective:	Non-technical Work	4
		18

SIXTH SEMESTER.

Physics 604 (404)	Electricity and Magnetism and Light and Sound	5
Economic Science 15	Engineering Economics	3
Mechanical Engineering 601 (401)	Analytical Mechanics	3
Civil Engineering 650 (450)	Advanced Descriptive Geometry	1
Civil Engineering 607 (407)	C. E. Drawing	1
Elective:	Non-technical Work	5
Civil Engineering 633	Summer Camp	

All students in Civil Engineering go into camp fifteen days each summer vacation for surveying practice.

18

Senior Year.

SEVENTH SEMESTER.

Mechanical Engineering 702 (502)	Analytical Mechanics	5
Civil Engineering 710 (510)	Railway Engineering	5
Electrical Engineering 703 (503)	Electric Railways and Power Transmission	2
Physics 723 (523)	Physical Laboratory	1
Civil Engineering 714 (514)	C. E. Laboratory	1
Elective:		4
		18

EIGHTH SEMESTER.

Mechanical Engineering 886 (686)	Analytical Mechanics	4
Civil Engineering 811 (611)	Railway Engineering	4
Civil Engineering 817 (617)	Structural Engineering	4
Civil Engineering 853 (653)	Materials of Construction	2
Civil Engineering 815 (615)	C. E. Laboratory	1
Engineering 803 (603)	Conservation of Natural Resources	1
Elective:		2
		18

Post Senior Year.

NINTH SEMESTER.

Civil Engineering 918 (718)	Structural Engineering	4
Civil Engineering 912 (712)	Roads and Pavements	2
Civil Engineering 923 (723)	Masonry and Foundations	2
Civil Engineering 921 (721)	Sanitary Engineering	3
Mechanical Engineering 984 (784)	Steam Engines and Boilers	2
Civil Engineering 916 (716)	C. E. Laboratory	1
Civil Engineering 925 (725)	Thesis begun	
Engineering 902 (702)	Specifications and Contracts	1
Elective:	Civil Engineering Work	3
		18

TENTH SEMESTER.

Engineering 1001 (801)	History of Engineering	1
Civil Engineering 1019 (819)	Structural Engineering	3

Civil Engineering 1020 (820)	Arches and Reinforced Concrete	2
Civil Engineering 1022 (822)	Water Supply Engineering	3
Geology 1003 (803)	Engineering Geology	3
Civil Engineering 1026 (826)	Thesis	3
Elective:	Civil Engineering Work	3
		18

A47. Field Work. Civil Engineering Course. Field work, three hours per week. One hour credit.

This course is designed to give the student some familiarity with the elements of surveying; i. e., pacing, ranging, and chaining, before they come to the Freshman year, and to put them in a position to get practical surveying work during their first summer vacation. Text book, Pence & Ketchum's Surveying Manual.

B48. Technical Drawing. Civil Engineering Course. An elementary course in drawing and free hand lettering for Academic students and is prerequisite to the regular Freshman year course in Lettering. Text book, Reinhart's Lettering. One hour credit. Three hours drawing per week.

101. Free Hand Lettering. Civil Engineering Course. Practice work on plain alphabets, both free hand and mechanical, with special attention to the simple free hand lettering. Preparation of plates illustrating the various types of letters and their uses in working drawings, maps, titles, etc. Teyt book, Reinhart's Lettering. One hour credit. Three hours drawing per week.

102. Field Work. Civil Engineering Course. Two hours credit. Six hours field work per week. Fee, $2.00.

Courses 102 and 203 are intended to train the student in the solution of the simple surveying problems and in the use of the simple surveying instruments; to give him a thorough preparation for the surveying work of the Sophomore year; and to give him sufficient experience to enable him to obtain a position as chainman or rodman during the summer vacation.

The class is divided into squads of three men each, the idea being to keep the number of men in a squad as low as is consistent with performing the work in order that each man may become familiar with all parts of the work. Pence & Ketchum's "Surveying Manual" is used as a text book and the men are required to perform the problems in strict accordance with the instructions in the "Manual," to check their work within practical limits, and to keep, in a standard field book, complete notes of all problems. Office problems are given from time to time, and as the field work requires it, recitations and lectures are given.

NOTE—The work in courses 102 and 203 is preparatory to the Field Work of the Sophomore and Junior year, which takes the same number of hours per week each year. Thus the student has the training to be obtained by three years' actual experience in the field.

141. Technical Lecture. Civil Engineering Course. Lectures on Civil Engineering Profession, on the reading of current literature, and on the elementary general features of engineering drawing and field work. See Course 444. One lecture per week.

203. Field Work. Civil Engineering Course. For general explanation of the work covered by this course of study, see Course 102. Prerequisite, C. E. 102. One hour credit. Three hours field work per week. Fee, $2.00.

204. Descriptive Geometry. Civil Engineering Course, two year courses in Mining Engineering and Clay Working. Many original problems are also solved in class and in the draughting room. Descriptive Geometry is the connecting link between pure mathematics and technical drawing, and is taught partly as a theoretical and partly as an applied subject. Many of the problems have direct application to engineering work. Prerequisites, Mechanical Drawing, Mathematics 3 and 5. Two hours credit. Five hours drawing and one hour lecture, per week.

206. Free Hand Lettering. Civil Engineering Course. Exercises in the rendering of free hand sketches. One hour credit. Three hours drawing per week.

231. Summer Surveying. Civil Engineering Course. See Course 633. Fifteen days work in the field.

242. Technical Lecture. Civil Engineering Course. Lectures on the work of the axemen, chainmen, and rodmen in general surveying and railway surveying and on camp equipment and management. One lecture per week.

305. Drawing, Tinting, Shading and Pen Topography. Civil Engineering Course. Course 101 continued. Practice with water colors, as used in tinting and in shading, the formation and use of topographical and structural symbols, contours and hatchings, and the preparation of topographical maps. One hour credit. Three hours per week.

308. Surveying. Civil Engineering and Horticulture and Forestry Courses, elective Agricultural and Science Courses. Prerequisite, Mathematics 5 and 6, and C. E. 102 and 203. Four hours credit. Recitations, two hours, and field work, six hours, per week. Fee, $3.00.

Courses 308 and 409 are continuations of Courses 102 and 203. The same method of organizing squads is followed. The work takes up the care and adjustments of surveying instruments, various problems in surveying illustrating the measurements of angles, running traverses by several methods, differential and profile leveling, uses of the plane table, determination of the true meridian by both Polaris and Solar observations, taking topography by various methods and land surveying, with special reference to United States system of land subdivision and to the retracing of lines and location of lost corners. Office work in connection with the field work requires the plotting of maps and profiles, the calculation of areas and balancing of surveys. Calculation of quantities and estimates of cost are made in connection with paving and drain surveys. Pence & Ketchum's "Surveying Manual" is used as a field manual.

The recitations cover Breed & Hosmer's "Principles and Practice of Surveying, Vol. I."

The study of Drainage Engineering demands special attention in this state and the course is adapted to such needs. The principles of the subject receive careful attention in the class room and are put into immediate practice in the investigation of various tracts of land in the vicinity of the College where development by drainage is advisable. The thorough drainage of individual farms is considered, and also the engineering and legal methods employed on large districts under county control. The usual reports of the engineer are required from each student, including complete maps and profiles, estimates of cost, and the report of the Commission on the assessment of the various properties. During the past few years it has frequently been found practicable for students to find remunerative work at drainage engineering at various places in the state in addition to their regular class work. Elliott's "Engineering for Land Drainage" is used as a text book for this portion of the work.

343. Technical Lecture. Civil Engineering Course. Lectures on tracing, blue-printing and other methods of reproducing engineering drawings, and on the work of the beginner in a structural drafting office. See course 444. One lecture per week.

345. Surveying. Agricultural and Mining Engineering and Ceramic Courses. Two hours credit. One recitation and three hours field work per week. See course 446. Fee, $2.00.

349. Advanced Descriptive Geometry. Civil Engineering Course. Consists in the solution of problems relating to warped surfaces and the preparation of isometrical projections of standard structures from working drawings. Text book, MacCord's Descriptive Geometry. Prerequisite, C. E. 204. One hour credit. Three hours drawing and lecture required.

407. Drawing. Plans of Structures. Civil Engineering Course. Course 305 continued. Preparation of working drawings of standard structures, especially railway structures. Prerequisite, course 305. One hour credit. Three hours per week.

409. Surveying. Civil Engineering and Horticulture and Forestry Courses, and elective Agricultural Courses. Prerequisite, course 308. For general explanation of the work covered by this course of study, see course number 308. Recitations, two hours, and field work, six hours, per week. Fee, $3.00.

432. Summer Surveying. Civil Engineering Course. See course 633. Fifteen days' work in field.

444. Technical Lecture. Civil Engineering Course. Lectures on drainage and topographical surveying, and on work of inspectors. One lecture per week.

Courses 141, 242, 343 and 444 inclusive are required of all Civil Engineers, and are designed to help inculcate the spirit of the engineering profession, and to permit the presentation of many things essential to the Civil Engineer which cannot readily be given in connected form in connection with the individual subjects of the course.

446. Surveying. Agricultural and Mining Engineering and Ceramic Courses. Prerequisite, Mathematics 5 and 6. Two hours credit. One recitation and three hours field work per week. Fee, $2.00.

Courses 345 and 446 are an abridgement of courses 308 and 409 and aim to cover only the most important uses of the tape, level and transit. Text book, Pence and Ketchum's "Surveying Manual."

450. Advanced Descriptive Geometry. Civil Engineering Course. The drawing is based on the principles of Descriptive Geometry and includes the solution of a number of problems in Shades, Shadows and Perspective. The work in Perspective Drawing includes the preparation and architectural rendering of a perspective drawing of a building or engineering structure, from the detailed plans. Prerequisite, course 204. One hour credit. Three hours per week.

510. Railway Engineering. Civil Engineering Course. Study of the methods of railway location, preliminary surveys made by both the cross section and the stadia methods; methods of the solution of the simple, compound, and vertical curves; the transition spiral, crossovers, turnouts, and wye tracks; the computation of earthwork and the determination of haul by the mass diagram.

During this semester a preliminary survey is made of a short line from which is prepared a contour map on which a paper location is made and the field notes calculated. This line is then located in the field and cross-sectioned. The grading is calculated, bills of material made up, bridges staked out, and cost of line is estimated. Text book, Allen's "Curves and Earthwork;" Talbott's "Transition Spiral." Prerequisites, Civil Engineering, 102, 203, 308, and 409. Five hours credit. Recitations, three hours, and field work, seven hours, per week. For one of the recitations, three hours of office work is substituted during part of the semester. Fee, $3.00.

514. Engineering Laboratory. Civil Engineering Course. Work in testing laboratory, making various standard tests of the materials of construction, including cement, building stones, paving brick, wood, cast iron, wrought iron and steel. Prerequisite, M. E. 401. One hour credit per semester. Fee, $5.00.

524. Practical Astronomy and Geodesy. Civil Engineering Course. Study of ordinary methods of determining latitude, longitude, and time with their application to the Geodetic Surveying. Prerequisite, C. E. 102, 203, 308, 409. Two and one-half hours credit. Recitation, four hours, and laboratory, three hours, per week, during last ten weeks of the semester.

527. Engineering Seminar. Civil Engineering Course. See course 830.

611. Railway Engineering. Civil Engineering Course. Study of the methods of railway construction, and maintenance, standard structures, track accessories, yards and terminals, etc., and the details of the economics of railroad location are dealt with at some length. The field work of this semester consists in the making of station surveys of existing towns, and the mapping of the same. The measuring and detailing of trestles, slip switches, turnouts, etc. Texts, Raymond's "Railroad Engineering;" Tratman's "Railway Track and Track Work."

During the past year complete location surveys for private companies, including complete estimates of cost and all the maps, profiles and other data needed to inaugurate construction were made of two interurban railways in Iowa by parties made up of students selected from the regular class, under direction of the professor in charge. One of these lines was thirty miles in length. It is the general policy to continue such work from time to time as opportunity occurs, selecting the students to do the work from those showing greatest proficiency in this and related studies. Prerequisite, Civil Engineering 510. Four hours credit. Recitations, two hours a week, and field work or draughting, seven hours a week. Fee, $3.00.

615. Engineering Laboratory. Civil Engineering Course. See 514. Prerequisites, Civil Engineering 514 and Mechanical Engineering 502. One hour credit.

617. Structural Engineering. Civil Engineering Course.

The recitation periods for the first few weeks are devoted to practical lectures upon the manufacturing of the standard steel shapes (from ore to finished product) and upon the fabricating of steel structures in the structural shops, from these shapes, and upon the general construction of steel structures, pointing out the names and the construction of the various types of structures; also the names and style of details of their parts so as to give the student a general knowledge of the details of metal structures before considering the theory involved in their design. At the same time in the drawing room the student is trained in making detail drawings of typical parts of structures, such as I beams with standard connections, posts, stringers, floor-beams, etc. This is intended to train the student in structural drafting and at the same time in the use of the manufacturers' Hand Books. After this lecture course and throughout the remainder of the semester, the recitations are devoted to the theory of stresses in ordinary metal structures while the work in the drawing room consists of actual determining of stresses in the above structures by the analytical and graphical methods, and also by the method of influence lines, using both uniform and concentrated loads, and of the designing and detailing of some of the above structures. Text book, Instructor's Notes. Credit, four hours.

628. Engineering Seminar. Civil Engineering Course. See Course 630.

633. Summer Surveying. Civil Engineering Course. Fifteen days' work in field.

In the work of Courses 231, 432, and 633, several of the professors of Civil Engineering and the students in Civil Engineering go into camp for fifteen days each summer vacation beginning the Saturday before Commencement, and conduct an organized topographical survey of some region in the state. Each year's work continues that of the preceding year, until a large area is mapped. At present Lake Okoboji and surrounding territory are being mapped. Lower classmen will serve in subordinate positions. Upper classmen will take responsible charge of parties, and will do the triangulating and final mapping. Students must pay their own traveling and living expenses. A corps of student officers has direct charge of the work, part of these officers being elected by the students and part appointed by the Department. It is one of the greatest honors in the course of Civil Engineering to be chosen on this corps of officers. The list of student officers for the summer camp of 1908 was as follows:

Chief Engineer—E. F. Kelly.
Assistant Chief Engineer—S. A. Knapp.
Computer—T. J. Schjeldahl.
Chief Draughtsman—F. M. Schader.
Junior Commissary—R. R. Strother.
Sophomore Commissary—G. C. Hoffman.
Freshman Commissary—G. E. Williams.

653. Materials of Construction. Civil and Agricultural Engineering Courses. A study of the materials of engineering construction, including cement, lime, stone, brick, sand, steel, etc. Two hours credit.

656. Structural Engineering. Mining Engineering and Ceramics Courses. The recitation periods for the first few weeks are devoted to practical lectures upon the manufacturing of the standard steel shapes (from ore to finished product) and upon the fabricating of steel structures in the structural shops, from these shapes, and upon the general construction of steel structures, pointing out the names and the construction of the various types of structures; also the names and styles of details of their parts so as to give the student a general knowledge of the details of metal structures before considering the theory involved in their design. At the same time in the drawing room the student is trained in making detailed drawings of typical parts of structures, such as I beams with standard connections, posts, stringers, floor-beams, etc. This is intended to train the student in structural drafting and at the same time in the use of manufacturers' Hand Books. After this lecture course, and throughout the remainder of the semester, the recitations are devoted to the theory of stresses in ordinary metal structures while the work in the Drawing room consists of actual determining of stresses in the above structures by the analytical and graphical methods, and also by the method of influence lines, using both uniform and concentrated loads, and of the designing and detailing of some of the above structures. Three hours credit.

712. Roads and Pavements. Civil Engineering Course. Study of good roads problem, traffic over country roads, tractive resistance, the best methods of constructing and maintaining earth, gravel, and broken stone roads, and the cost of various kinds of roads. In the study of country roads, especially as relating to Iowa conditions, great assistance is given by the fact that the College is by law the State Highway Commission of Iowa. All its data, plans, maps and publications are available and are largely made use of. In connection with pavements among the topics studied are city streets and grades, classes and methods of construction of pavements, and the cost of various kinds of paving. Text book. Baker's "Roads and Pavements." Recitations, two hours per week.

713. Roads and Pavements. Elective Agricultural Courses. Work similar to Course 712. Text book, Baker's "Roads and Pavements." Recitations, two hours per week.

716. Engineering Laboratory. Civil Engineering Course. Experiments in Hydraulic laboratory, as gauging the flow of water over weirs, through orifices and in sewer pipes, measuring the friction in pipes, and testing the efficiency of pumps and hydraulic motors. One hour credit Fee, $3.00.

718. Structural Engineering. Civil Engineering Course. After a short review of the structural work taken in the Junior year, the remainder of the semester is devoted to the theory of stresses in what is known as "higher structures," that is, cantilever and suspension bridges, steel arches, lift bridges, draw bridges, etc., and to the designing of same.

Text book, Johnson's "Framed Structures," supplemented by Instructor's Notes. Credit, four hours.

721. Sanitary Engineering. Civil Engineering Course. Study of principles and methods involved in the design, construction and maintenance of sewerage systems, house plumbing and sewage disposal. Text book, Folwell's "Sewerage," and Professor Marston's Notes. Two recitations and one afternoon of designing per week. Three hours credit.

723. Masonry Structures and Foundations. Civil Engineering Course. Study of principles involved in the design and construction of foundations, and in the design, construction, and maintenance of all classes of masonry structures. Text book, Baker's "Masonry Structures." Two recitations per week.

725. Thesis. Civil Engineering Course. Work begun.

729. Engineering Seminar. Civil Engineering Course. See Course 830.

735. Irrigation Engineering. Civil Engineering Course by those students who elect special work in Hydraulic Engineering. Irrigation history and laws, the use and duty of water, irrigation surveys and designs, the design and construction of ditches and flumes, and dams and reservoirs. Special attention is given to the work of the United States Reclamation Service. Considerable time is devoted to reference work, consisting in studying and preparing reports upon various irrigation systems and structures and other topics of interest. In this work the current technical literature is used to a large extent. Three hours per week are devoted to designing of irrigation structures, dams, headworks, regulators, canals, etc. Estimates of cost of structures designed are made. The textbook is Wilson's "Irrigation Engineering." Prerequisite, M. E. 686. Three hours credit. Recitations, two hours, and designing, three hours, per week.

738. Structural Engineering. Civil Engineering Course by students who elect special work in Structural Engineering. This course is taught in conjunction with Civil Engineering 718 in a special class to students taking structural engineering, making a total of seven credit hours. The work in "higher structures" is very much more thorough and complete than in 718 alone. Three hours credit.

751. Surveying. Electrical Engineering Course. Text book, Pence & Ketchum's Surveying Manual.

Course 751 is designed to give to students in Electrical Engineering a good working knowledge of the engineer's transit and level and their common uses, sufficient to enable them to perform such elementary surveying problems as they are likely to meet in connection with their electrical work. Three hours credit. Recitation, one hour, and field work, six hours, per week.

754. Signal Engineering. Civil Engineering Course by those who elect special work for senior year in Railway Engineering. A study of the methods of signalling by the various railroads, their relative effectiveness and the rules governing the use of the same, train orders, interlocking, etc. Prerequisites, Civil Engineering 510 and 611. One hour credit.

819. Structural Engineering. Civil Engineering Course. This work during the first part of the semester is really a continuation of the structural work taken by same students in the first semester, after which the time will be devoted to a general review of Structural Engineering, in order that the student may have a working knowledge of the subject. Three hours credit.

820. Arches and Reinforced Concrete. Civil Engineering Course. The recitations are devoted to the mechanics of reinforced concrete construction and masonry, analyzing the stresses in reinforced concrete slabs, beams, floors, roofs, retaining walls, and also masonry and reinforced concrete arches. The work in the drawing room consists of: Designing a reinforced concrete beam highway bridge; beams, columns, and floor for an office building; designing of a masonry and a reinforced concrete arch, and also a retaining wall, making complete tracings of most of the designs.

Text-book, "Principles of Reinforced Concrete Construction," by Turneaure and Maurer, supplemented by Instructor's Notes. Two hours credit.

822. Water Supply Engineering. Civil Engineering Course. The principles and methods involved in the design, construction and maintenance of water works systems. Text-book, Turneaure and Russel's "Water Supply Engineering." Three recitations and one afternoon of designing per week. Three hours credit.

826. Thesis. Civil Engineering Course. Original research on some chosen subjects, as the study and design of some engineering project (including the surveys), the investigation of some engineering question, or an experimental investigation. Three hours credit. Nine hours per week. Students are required to put in as much additional time as may be necessary to thoroughly work up the subject chosen, and to prepare a well-digested and complete write-up of the results.

830. Engineering Seminar. Civil Engineering Course.

The Civil Engineering Seminar, Courses 527, 628, 729 and 830, meets once each week, while College is in session, and has for its members the professors and the instructors in Civil Engineering, and all students in the Junior and Senior classes in the course in Civil Engineering.

The Juniors and Seniors meet separately and each seminar has the organization of an engineer's club, and arranges for programs by students and others similar to those of engineering clubs.

834. Railway Economics. Civil Engineering Course by those who elect special work for Senior year in Railway Engineering. Study of the organization, operation, construction, extension, improvement, existing conditions, operation and regulation of railways with reference to their great duty as public servants as well as their obligations to the holder of their securities.

First—A study of the principles of incorporation, keeping in mind the weighty obligations assumed by any public service corporation who is given and accepts the "Right of eminent domain."

Second—A study of a railway's relation to its stockholders.

Third—The relation of the national government and the methods of government regulation existing and proposed.

Fourth—Their relation to the state and the shipper, including the subjects of railway capital, income, expenditures, the basis of freight rates, freight classification and taxation. Prerequisites Civil Engineering 510, 611, and 754. Three hours credit. Recitations, two hours, and designing three hours, per week.

836. Hydraulic Engineering. Civil Engineering Course by those students who elect special work for the Senior year in Hydraulic Engineering. Hydraulic power development, water wheel, turbine, and impulse wheel installations are studied in their various details, the text-book being Mead's "Water Power Engineering." In addition to the text-book work, considerable time is spent in reference work, studying from the current technical literature and preparing reports upon various existing power plants and other topics of interest along the same lines. Three hours per week are devoted to designing the various structures connected with hydraulic power plants,—dams, pen-stocks, power canals, pipe lines, etc. Estimates of cost of the structures designed are made. Prerequisite, M. E. 686. Three hours credit. Recitations, two hours, and designing, three hours, per week.

839. Structural Engineering. Civil Engineering Course by students who elect special work in Structural Engineering. This course is taught in conjunction with Civil Engineering 819 in a special class to students taking structural engineering, giving a total of five credit hours and is very much more thorough and complete, especially in "higher structures." Three hours credit.

855. Water Supply Engineering. Mechanical Engineering Course. This course is the same as 822 with the omission of the designing. Two hours credit.

DEPARTMENT OF PHYSICS AND ELECTRICAL ENGINEERING.

LOUIS BEVIER SPINNEY, PROFESSOR.
FRED ALAN FISH, PROFESSOR OF ELECTRICAL ENGINEERING.
ADOLPH SHANE, ASSOCIATE PROFESSOR OF ELECTRICAL ENGINEERING.
W. B. ANDERSON, ASSISTANT PROFESSOR OF PHYSICS.
A. H. HOFFMAN, ASSISTANT PROFESSOR OF PHYSICS.
WM. KUNERTH, INSTRUCTOR IN PHYSICS.
M. W. PULLEN, INSTRUCTOR IN PHYSICS AND ELECTRICAL ENGINEERING.

This department aims to meet the needs of young men who have in mind the practice of electrical engineering in any of its various applications. In outlining the courses the object in view has been to secure for the student a thorough drill in those sciences, the principles of which underlie all electrical engineering practice, to secure for him a training in the application of scientific principles to the solution of practical problems in engineering, and to familiarize him with such methods of the laboratory and testing room as are available for practical and commercial determinations.

The sciences of Mathematics, Physics and Chemistry, are emphasized, as it is believed they are of first importance in such a course. The attention of the student is directed to the value of these subjects and he is urged to give them his most careful consideration.

In recognition of the fact that a knowledge of Mechanical Engineering is essential to many electrical engineering operations, a large part of the student's time is devoted to a training in this direction.

Physics is the basis of the study of electricity and magnetism, the phenomena of which underlie electrical engineering theory and design, and is manifestly of sufficient importance to demand considerable time and attention in the training of the electrical engineer. In addition to the work in physics prescribed for all engineering students, the electrical engineering student spends six to twelve hours per week in the Junior and Senior years in the physical laboratory and class room.

The Physics lecture room is modern in its equipment, which includes a convenient system of darkening shutters for the windows and a large permanent lantern screen, to facilitate demonstration work. At the lecture room tables are electric, gas and water connection, placing at the disposal of the lecturer water pressure, compressed air and electric currents from storage batteries, and direct or alternating current dynamos.

The department has a good equipment in apparatus for demonstration purposes, which is stored in apparatus rooms adjoining the lecture room.

The general laboratory rooms are large and well lighted and are equipped with heavy oak tables, slate-top piers and wall tables with heavy stone tops for the support of the laboratory apparatus. Convenient electric, gas and water connections are provided. A very serviceable equipment in the apparatus used in general physical laboratory work is furnished. Among other apparatus may be mentioned a laboratory clock, with electric connections, a chronograph, a reversion pendulum, two torsion pendulums for the experimental determination of "moment of inertia" and the "coefficient of simple rigidity," a physical pendulum, apparatus for the determination of the "intensity of gravity" by observations on a body rolling on an inclined plane, analytical balances, Jolly's balance, hydrostatic balance, apparatus for the determination of "Young's Modulus" by stretching and by bending, apparatus for the coefficient of linear expansion, a cathetometer, optical benches, telescopes and microscopes, spectroscopes, a saccharimeter, hydrometers, thermometers, barometers, galvanometers, Wheatstone bridges, "testing apparatus," electrocalorimeters, silver, copper and water coulombmeters, etc.

The photometry rooms are equipped with several photometer benches and are furnished with gas and electric connection. The arrangement of apparatus is made with a view of facilitating the regulation tests of arc and incandescent lamps as well as those of other sources of illumination.

Besides several ordinary photometers, the equipment includes a Matthew's Integrating Photometer, a storage battery of sixty 15 ampere cells, a recording voltmeter, a Weston standard voltmeter and the necessary portable voltmeters and ammeters.

The photographic laboratory is equipped with cameras and other appliances, dark-rooms, skylights, screens, and back grounds for portrait and copying work, and water facilities. The equipment enables the carrying forward of a very practical course in photography in its various applications.

The dynamo laboratory equipment includes 26 dynamos for experimental purposes, among which are three 7½ K. W. 125 volt rotary converters, one 10 H. P. 220 volt 60 cycle 2-phase induction motor with a wound rotor and external variable resistance with controller, four single-phase alternators of 1, 10, 25, and 35 K. W. capacity, two arc light machines, one 45 K. W. Edison generator, one 25 H. P. four-pole 110 volt motor, one 7½ K. W., 220 volt, revolving field alternator for 1, 2, 3, 6 or 12 phases, one 10-H. P., 220 volt, 2 or 3 phase induction motor with internal resistance type rotor, two 7½ K. W., 125 volt, compound wound d. c. generators, one 10-H. P., 125 volt, inter-pole d. c. motor, two 10 H. P. 125 volt shunt motors, one 5 H. P. 110 volt series d. c. motor, and several 2 and 3 H. P. series and shunt wound direct current machines. The instrument equipment of the laboratory consists of about 60 modern alternating and direct current voltmeters, ammeters and Wattmeters, a number of which are of the switch board type and are mounted at convenient points about the laboratory. The transformer equipment includes a number of modern types of transformers among which are two sets for transforming 3-phase to 2-phase or vice versa.

There are four switch boards in the laboratory, as follows: One containing the terminals of the circuits coming into the laboratory from the power station and from the physical laboratories; one containing instruments, circuit breakers, rheostats, synchronizing apparatus and terminals for the rotary converter set; one containing terminals and apparatus for the induction motor outfit; and one containing no instruments but having upon it jack terminals for 90 circuits which radiate to the other boards, to various convenient points about the laboratory and to a number of lamp banks on the walls; the purpose of this last board being to make it possible to connect together any circuits that may be desired.

There is also a considerable number of other pieces of apparatus, such as instantaneous contact makers, prony brakes, speed counters, inductance coils, tin resistance frames, water rheostats, etc.

In addition to this equipment, the student has access for experimental and test purposes, to the electric machinery of the College power house and lighting plant. Among other machines in this plant are two 15 K. W. Edison dynamos; one 30 K. W. Edison dynamo; one 15 K. W. 500 volt generator; one four-pole 18 K. W. compound-wound generator; one 15 K. W. alternator; one 30 K. W. alternator, and one 60 K. W. alternator. There is also a series of motors for driving the machinery of the Mechanical Engineering Department which range in size from five to twelve horse-power which are available for test purposes.

The repair shop is fitted with an engine lathe, a speed drill, a set of machinist's and carpenter's tools and a stock of shop supplies. This room is used for the repair and manufacture of apparatus.

COURSES IN ELECTRICAL ENGINEERING.

Academic Year.

Any student who at entrance presents satisfactory credit for part of the Academic Course, or who by examination passes part of it satisfactorily, will be classified in such of the remaining work offered in the Academic year as the Dean of the Junior College and the Dean of Engineering shall consider will best prepare him for his college course. After providing in such classification for the remainder of the thirty credits required for entrance to college, the student may complete his schedule by taking up some of the Freshman studies.

A SEMESTER.

			Required semester hours
	Mathematics 3,	Algebra	5
	English 2,	Rhetoric and Composition	5
	Modern Languages The Language selected must be carried through the entire year.		
Choice	Language 1,	French 5	5
	Language 5,	German 5	
	Language 30,	Spanish 5	
	Civics 1,	Government in State and Nation	2
	Mechanical Engineering 19,	Perspective Drawing	1
		Total semester hours	18

B SEMESTER.

	Mathematics 5,	Plane Geometry	3
	Mathematics 6,	Solid Geometry	2
	Literature 12,	English Classics	4
	Modern Languages The Language selected must be a continuation of the one chosen in the first semester.		
Choice	Language 2,	French 5	5
	Language 6,	German 5	
	Language 31,	Spanish 5	
	History 16,	The National Period	3
	Mechanical Engineering 29,	Joinery and Wood Turning	1
		Total semester hours	18

FOUR YEAR COURSE IN ELECTRICAL ENGINEERING.

This course leads to the degree of Bachelor of Science in Electrical Engineering. Graduates from this course may receive the full professional degree of Electrical Engineer by devoting one year to resident study and one year to a responsible engineering position and presentation of a satisfactory thesis or by five years service in responsible engineering work and presentation of thesis.

N. B. ENGINEERING COURSE NUMBERS.—The number in hundreds place indicates the semester in which the subject is taught. If the subject is also taught in a previous semester, the true course number is followed by the descriptive course number in parenthesis.

****Freshman Year.**

FIRST SEMESTER.

		Required semester hours
Mathematics 20,	Algebra	4
Mathematics 21,	Plane Trigonometry	1
Modern Languages		

The Language selected must be continued through the entire year.

Choice Language 18 or 57,	French 3	3
Language 20 or 73,	German 3	
Language 36 or 45,	Spanish 3	
English 10,	Narration and Description	3
Chemistry 41,	General Chemistry	3
Mechanical Engineering 130,	Shop Work	2
Electrical Engineering 101,	Technical Lecture	
Mechanical Engineering 121,	Mechanical Drawing	2
Military 1,	Military Drill	
	Total semester hours	18

SECOND SEMESTER.

		Required semester hours
Mathematics 22,	Trigonometry	2
Mathematics 23,	Analytical Geometry	3
Modern Languages		

The Language selected must be a continuation of the one chosen in the first semester.

Choice Language 19 or 58,	French 3	3
Language 21 or 74,	German 3	
Language 37 or 46,	Spanish 3	
English 11,	Exposition	3
Chemistry 42,	General Chemistry	3
Mechanical Engineering 232,	Shop Work	2
Electrical Engineering 202,	Technical Lecture	
Mechanical Engineering 220,	Descriptive Geometry	2
Military 2,	Military Drill	
	Total semester hours	18

**Freshmen who show deficient preparation in English or Mathematics may be assigned by the Dean of the Junior College and the Dean of Engineering to special classes, with one credit hour more work than indicated above, or in case of clear indication of failure, even with this arrangement, they may be assigned to Academic classes.

Sophomore Year.

THIRD SEMESTER.

		Required semester hours
Mathematics 24,	Analytical Geometry	2
Mathematics 25,	Calculus	3
English 12,	Argumentation	2
Chemistry 43,	Qualitative Analysis	3
Physics 303,	Mechanics and Heat	5
Mechanical Engineering 331,	Shop Work	2
Mechanical Engineering 322,	Mechanical Drawing	1
Military 3, or Athletics		
	Total semester hours	18
History 17,	The American People	1

To be taken in Sophomore or Junior year.

FOURTH SEMESTER.

		Required semester hours
Mathematics 26,	Differential and Integral Calculus	4
Chemistry 45,	Analytical Chemistry	2
Physics 404,	Electricity and Magnetism and Light and Sound	5
Mechanical Engineering 437,	Shop Work	1
Mechanical Engineering 439,	Shop Work	1
Mechanical Engineering 401,	Analytical Mechanics	3
Mechanical Engineering 423,	Mechanical Drawing	2
Military 4, or Athletics		
	Total semester hours	18
History 18,	American Statesmen	1

To be taken in Sophomore or Junior year.

Junior Year.

FIFTH SEMESTER.

		Required semester hours
Physics 506,	Electricity and Magnetism	3
Physics 514,	Physical Laboratory	2
Mechanical Engineering 502,	Analytical Mechanics	5
Mechanical Engineering 503	Materials of Construction	3
Mechanical Engineering 533,	Shop Work	2

Mechanical Engineering 512,	Mechanical Engineering Laboratory	1
Mathematics 10,	Differential Equations	2
	Total semester hours	18

Optional:

English 7,	Debating	1
History 7,	America in the Far East	2
Civics 7,	Comparative Government	2
Literature 13,	Literature	2

SIXTH SEMESTER.

		Required semester hours
Electrical Engineering 604,	Direct Current Machinery	4
Electrical Engineering 619,	Electrical Engineering Laboratory	1
Physics 607,	Theory of Alternating Currents	3
Physics 617,	Physical Laboratory	2
Mechanical Engineering 686,	Analytical Mechanics	4
Mechanical Engineering 689,	Machine Design	2
Mechanical Engineering 613,	Mechanical Engineering Laboratory	1
Engineering 603,	Conservation of Natural Resources	1
	Total semester hours	18

Optional:

English 8,	Debating	1
History 9,	The Far Eastern Question	2
Civics 7,	Comparative Government	2
Literature 14,	Literature	2

Senior Year.

SEVENTH SEMESTER.

		Required semester hours
Elertrical Engineering 708,	Alternating Current Machinery	4
Electrical Engineering 713,	Principles of Telephony	1
Electrical Engineering 720,	Electrical Engineering Laboratory	2
Electrical Engineering 724,	Electrical Engineering Design	2
Electrical Engineering 729,	Electrical Engineering Seminar	
Mechanical Engineering 784,	Steam Engines and Boilers	2
Engineering 702,	Specifications and Contracts	1
Civil Engineering 751,	Surveying	3
Economic Science 9,	Outlines of Economics	3
Electrical Engineering,	Thesis begun	
	Total semester hours	18

Optional:

History 7,	America in the Far East	2
Civics 7,	Comparative Government	2
Literature 13,	Literature	2
English 7,	Debating	1

EIGHTH SEMESTER.

		Required semester hours
Electrical Engineering 816,	Electric Power Plants and Transmission	3
Electrical Engineering 809,	Electric Railways	3
Electrical Engineering 821,	Electrical Engineering Laboratory	2
Electrical Engineering 825,	Electrical Engineering Design	2
Electrical Engineering 830,	Electrical Engineering Seminar	
Electrical Engineering 840,	Electrical Engineering Thesis	4
Mechanical Engineering 809,	Constructive Engineering	3
Engineering 801,	History of Engineering	1
	Total semester hours	18

Optional:

Economic Science 12,	Engineering Economics	2
History 9,	The Far Eastern Question	2
Civics 7,	Comparative Government	2
English 8,	Debating	1

FIVE YEAR COURSE IN ELECTRICAL ENGINEERING.

The following five year course in Electrical Engineering is offered in response to a demand for an engineering course giving the student a better education in the culture studies and the natural sciences, together with an opportunity to specialize along certain engineering lines not possible in the time available in the four year course of study. The course includes all of the work given in the four year course and in addition thirty hours of culture and scientific studies, together with four hours of work given in the engineering departments.

This course leads to the same degree granted to graduates of the four year course but a graduate may obtain the full professional degree of Electrical Engineer after one year of responsible professional work and the presentation of a satisfactory thesis.

N. B. ENGINEERING COURSE NUMBERS.—The number in hundreds place indicates the semester in which the subject is taught. If the subject is also taught in a previous semester, the true course number is followed by the descriptive course number in parenthesis.

Freshman Year.

FIRST SEMESTER.

Mathematics 20,	Algebra	4
Mathematics 21,	Plane Trigonometry	1
Modern Language		

The Language selected must be continued through the year.

Choice: Language 18 or 57, Language 20 or 73. Language 36 or 45,	French 3 German 3 Spanish 3	3
English 10,	Narration and Description	3
History 6,	French Revolution and XIXth Century	3
Mechanical Engineering 121,	Mechanical Drawing	2
Mechanical Engineering 130,	Forge Work	2
Electrical Engineering 101,	Technical Lecture	
Military 1,	Drill	
	Total semester hours	18

SECOND SEMESTER.

Mathematics 22,	Trigonometry	2
Mathematics 23,	Analytical Geometry	3
Modern Language		

The Language selected must be a continuation of the one chosen in the first semester.

Choice: Language 19 or 58, Language 21 or 74, Language 37 or 46,	French 3 German 3 Spanish 3	3
English 11,	Exposition	3
History 4,	Division and Reunion, 1850-1876	3
Mechanical Engineering 220,	Descriptive Geometry	2
Mechanical Engineering 232,	Foundry	2
Electrical Engineering 202,	Technical Lecture	
Military 2,	Drill	
	Total semester hours	18

Sophomore Year.

THIRD SEMESTER.

Mathematics 24,	Analytical Geometry	2
Mathematics 25,	Calculus	3
English 12	Argumentation	2

Chemistry 2,	General Chemistry	5
Mechanical Engineering 322,	Mechanical Drawing	1
Mechanical Engineering 331,	Pattern Work	2
History 17,	The American People	1
Elective:	Non-technical Work	2
Military 3, or Athletics,		
	Total semester hours	18

FOURTH SEMESTER.

Mathematics 26,	Differential and Integral Calculus	4
English 13,	Advanced Composition	2
Chemistry 5,	Qualitative Analysis	5
Mechanical Engineering 423,	Mechanical Drawing	2
Mechanical Engineering 437,	Pattern Work	1
Mechanical Engineering 439,	Pipe Fitting	1
Civics 6,	Actual Government	3
Military 4, or Athletics		
	Total semester hours	18

Junior Year.

FIFTH SEMESTER.

Mathematics 10	Differential Equations	2
Physics 503 (303),	Mechanics and Heat	5
Economic Science 9,	Outlines of Economics	3
Civil Engineering 545 (345),	Surveying	2
Mechanical Engineering 533,	Machine Work	2
Literature 13,	Literature	2
Elective:	Non-technical Work	2
	Total semester hours	18

SIXTH SEMESTER.

Physics 604 (404),	Electricity and Magnetism, Light and Sound	5
Economic Science 12,	Engineering Economics	3
Literature 14,	Literature	2
Mechanical Engineering 601 (401),	Analytical Mechanics	3
Mechanical Engineering 634	Machine Work	2
Civil Engineering 646 (446),	Surveying	2
History 18,	American Statesmen	1
	Total semester hours	18

Senior Year.

SEVENTH SEMESTER.

Physics 706 (506),	Electricity and Magnetism	3
Physics 714 (514),	Physical Laboratory	2
Mechanical Engineering 702 (502),	Analytical Mechanics	5
Mechanical Engineering 703 (503),	Materials of Construction	3
Mechanical Engineering 712 (512),	Mechanical Engineering Laboratory	1
Elective:	Non-technical Work	4
	Total semester hours	18

EIGHTH SEMESTER.

Physics 807 (607),	Theory of Alternating Currents	3
Physics 817 (617),	Physical Laboratory	2
Electrical Engineering 804 (604),	Direct Current Machinery	4
Electrical Engineering 819 (619),	Electrical Engineering Laboratory	1
Mechanical Engineering 805 (605),	Machine Design	2
Mechanical Engineering 806 (606),	Analytical Mechanics	4
Mechanical Engineering 813 (613),	Mechanical Engineering Laboratory	1
Engineering 803 (603),	Conservation of Natural Resources	1
	Total semester hours	18

Post Senior Year.

NINTH SEMESTER.

Electrical Engineering 908 (708),	Alternating Current Machinery	4
Electrical Engineering 920 (720),	Electrical Engineering Laboratory	2
Electrical Engineering 924 (724),	Electrical Engineering Design	2
Electrical Engineering 929 (729),	Electrical Engineering Seminar	
Mechanical Engineering 984 (784),	Steam Engines and Boilers	2

Engineering 902 (702),	Specifications and Contracts	1
Geology 901 (501),	General Geology	4
Elective:		3
Electrical Engineering,	Thesis begun	
	Total semester hours	18

TENTH SEMESTER.

Electrical Engineering 1009 (809),	Electric Railways	3
Electrical Engineering 1016 (816),	Power Plants and Transmission	3
Electrical Engineering 1021 (821),	Electrical Engineering Laboratory	2
Electrical Engineering 1025 (825),	Electrical Engineering Design	2
Electrical Engineering 1030 (830),	Electrical Engineering Seminar	
Electrical Engineering 1040 (840),	Electrical Engineering Thesis	4
Engineering 1001 (801),	History of Engineering	1
Elective:		3
	Total semester hours	18

COURSES IN PHYSICS.

205. Mechanics, Heat and Light. Courses in the Division of Agriculture, except Agricultural Engineering. A study of the fundamental principles of Physics and their applications. Lecture and recitations. Prerequisite, Mathematics 17. Three hours credit. Fee for mimeograph notes, $1.50.

301. Mechanics and Heat. Domestic Economy Course and the choice between Physics 301 and 303 in the General Science Course. Includes study of mass, force, energy and power, also graphic methods of solving problems in force actions, velocities, etc., radiation in general and wave motion; also mechanics and heat. Prerequisites, Mathematics 4, 5 and 6. Three hours credit. Recitations and lectures. Fee for mimeograph notes, $1.50.

303. Mechanics and Heat. Engineering Courses and Agricultural Engineering Course and a choice between this and 301 in the General Science Course. Study of the fundamental principles of the work, also study of vector quantities and their treatment. A view of the subject from the mathematical standpoint is emphasized and the student is urged to familiarize himself with the theoretical side of the question, as it is believed that such a foundation is essential to the work which follows. Prerequisites, Mathematics 4, 5, and 6. Five hours credit. Lectures three hours, recitation one hour, and laboratory one period per week. Fee, $3.50 (Laboratory, $2.00; notes, $1.50).

402. **Electricity and Magnetism and Light and Sound.** Domestic Economy and the choice between this study and 404 in the General Science Course. Includes study of electricity, magnetism, light and sound. This course together with course 301 is to meet the needs of the students in Domestic Economy. The breadth of the course, together with the emphasis which is placed upon the essentials, adapt it to the needs of teachers and others who desire a general training in physics. Prerequisite, Physics 301. Three hours credit. Lectures and recitations. Fee for mimeograph notes, $1.50.

404. **Electricity and Magnetism and Light and Sound.** Engineering Courses and Agricultural Engineering, and a choice between this and 402 in the General Science Course, and elective Agricultural Courses. Prerequisite, Physics 303. Five hours credit. Lectures three hours, recitation one hour, and laboratory one period per week. Fee, $3.50. (Laboratory, $2.00; notes, $1.50.)

506. **Electricity and Magnetism.** Mechanical and Electrical Engineering Courses. Elementary theory of electricity and magnetism; discussion of measuring instruments and laboratory methods of measuring various electrical quantities. Lectures, recitations, and problems. Text-book, Nichols and Franklin, "Elements of Physics," Vol. II. Prerequisites, Physics 303 and 404, and Mathematics 26. Three hours credit.

509. **Theory and Practice of Photography.** Elective in all Courses (only upon recommendation by head of department in which student is taking his major work). Lecture, one hour, and laboratory, one period per week. Fee, $5.00.

514. **Physical Laboratory.** Electrical Engineering Course, and elective Science Courses. Measurement of length, mass and time, determination of physical constants, use of barometer, thermometry, calorimetry, etc. Prerequisites, Physics 303 and 404 and Mathematics 26. Laboratory, two periods per week. Fee, $5.00.

516. **Physical Laboratory, Elementary Physical Measurements.** Elective Science Courses. Work as offered in Course 615. Laboratory, two periods a week. Fee, $5.00.

523. **Physical Laboratory.** Mechanical and Civil Engineering and Ceramics Courses, and elective Science Courses. Laboratory, one period per week. Fee, $3.00.

607. **Theory of Alternating Currents.** Electrical Engineering Course. Prerequisites, Physics 506 and Mathematics 10. Lectures and recitations, three hours per week.

615. **Physical Laboratory, Elementary Physical Measurements.** Mechanical Engineering Course, elective Science Courses. Measurement of electro-motive force and internal resistance of primary and secondary batteries, use of Wheatstone's bridge, measurement of current,

determination of galvanometer constants, high resistance measurements, insulation tests. Laboratory, one period per week. Fee, $3.00.

617. Physical Laboratory, Elementary Physical Measurements. Electrical Engineering Courses, elective Science Courses. Work as offered in Course 615. Laboratory, two periods per week. Fee, $5.00.

COURSES IN ELECTRICAL ENGINEERING.

101. Technical Lecture. Electrical Engineering Course in connection with required Shop Work. Elementary principles of Electrical Engineering. One lecture per week.

202. Technical Lecture. Electrical Engineering Course in connection with required Shop Work. Continuation of Electrical Engineering 101. One lecture per week.

503. Electric Power Transmission and Railways. Civil Engineering Course. An elementary study of the principles of electrical machinery and the transmission and distribution of power for industrial purposes, including power plants, transmission lines and electric railways. Prerequisites, Physics 303 and 404, and Mathematics 26. Two hours per week

604. Direct Current Machinery. Electrical Engineering Course. General theory of the direct current dynamo, the establishment of electromotive forces by induction; the magnetic circuit, armature windings, characteristic curves, and the adaption of the different types of direct-current machinery to various commercial purposes is included. Text, Franklin and Esty's "Elements of Electrical Engineering." Prerequisite, Physics 506. Lectures and recitations, four hours per week.

610. Direct Current Machinery. Mechanical Engineering Course. Same topics as in Electrical Engineering 604, but with less detail. Prerequisite, Physics 506. Text-book, Franklin and Esty's "Elements of Electrical Engineering." Recitations, three hours per week.

619. Electrical Engineering Laboratory. Electrical Engineering Course. Elementary experiments on direct current circuits, machines and instruments. Must be preceded by Physics 517 and accompanied by Electrical Engineering 604 or 610. Laboratory, one period per week. Fee, $3.00.

708. Alternating Current Machinery. Electrical Engineering Course. Study of alternating current generators, motors, transformers, etc. Prerequisites, Physics 607 and Electrical Engineering 604. Lectures and recitations. Four hours per week.

712. Electric Power Transmission and Mining. Mining Engineering Course. A study of the application of electrical machinery to industrial purposes, including electrical transmission and mining. Prerequisites, Physics 303 and 404, and Mathematics 26. Lectures and recitations, three hours per week.

713. **Telephony.** Electrical Engineering Course. General study of telephony, the telephone, telephone lines, and commercial apparatus. Prerequisite, Physics 607. Lecture, one hour per week.

717. **Electrical Engineering Laboratory.** Mechanical Engineering Course. Study of direct current machinery. Prerequisite, Electrical Engineering 604. Laboratory, one period per week. Fee, $3.00.

720. **Electrical Engineering Laboratory.** Electrical Engineering Course. Advanced study of direct current machinery operation and beginning study of alternating current circuits and instruments. Must be accompanied or preceded by Electrical Engineering 708. Prerequisites, Electrical Engineering 619 and 604, or 610 and Physics 607. Laboratory, two periods per week. Fee, $5.00.

724. **Electrical Engineering Design.** Electrical Engineering Course. The design of direct current generators. Prerequisite, Electrical Engineering 604. Two afternoons per week.

729. **Electrical Engineering Seminar.** Electrical Engineering Course. Consists of preparation, presentation and discussion of papers upon special assigned topics in Electrical Engineering. Papers must be carefully written and submitted to professor in charge.

809. **Electric Railways.** Electrical Engineering Course. A study of electric railway systems and apparatus, including the design of feeders and trolleys and the determination of the proper equipment for a given service. Prerequisite, Electrical Engineering 708. Lectures and recitations, three hours per week.

815. **Alternating Current Machinery.** Mechanical Engineering Course. Same topics as Electrical Engineering 708, but with less detail. Prerequisite, Electrical Engineering 610. Lectures and recitations three hours per week.

816. **Electric Power Plants and Transmission.** Electrical Engineering Course. A study of the principles underlying the lay-out of power-house and switchboard circuits and of distributing systems, including the determination of the most economical size of conductors for such systems, taking into account current prices of materials, rates of interest and depreciation, and cost of power, also numerous original and practical problems illustrating the principles. Prerequisite, Electrical Engineering 708. Lectures and recitations, three hours per week.

818. **Electrical Engineering Laboratory.** Mechanical Engineering Course. Study of alternating current circuits and machinery. Prerequisite, Electrical Engineering 717. Must be accompanied by Electrical Engineering 815. Laboratory, one period per week. Fee, $3.00.

821. **Electrical Engineering Laboratory.** Electrical Engineering Course. Continuation of Course 720. Study of alternating current generators and motors, and commercial transformers. Laboratory, two periods per week. Fee, $5.00.

825. **Electrical Engineering Design.** Electrical Engineering

Course. The design of alternating current generators and transformers. Prerequisite, Electrical Engineering 724. Two afternoons per week.

830. Electrical Engineering Seminar. Electrical Engineering Course. Continuation of Course 729.

840. Electrical Engineering Thesis. Electrical Engineering Course. Preparation of a thesis on some Electrical Engineering subject —the designing and construction of some electrical machine or measuring instrument, the efficiency test and critical study of some dynamo-electric machine or power plant, or of electrical research work of special direction. Four hours credit per week.

DEPARTMENT OF MINING ENGINEERING.

SAMUEL WALKER BEYER, PROFESSOR.
LAURENCE C. HODSON AND IRA A. WILLIAMS, ASSOCIATE PROFESSORS.
C. E. ELLIS, INSTRUCTOR.

The courses in Mining Engineering are planned to give the student a ready familiarity with the branches which form the ground work of the science of Mining and Metallurgy. The Department of Mining Engineering aims to give him such a thorough training in the fundamentals as will enable him after graduation to acquire in a comparatively short time the practical experience absolutely necessary before he is fitted to assume positions of great responsibility in the mining industries. The Department offers three courses, a four years', a five years', and a two years' course. The first two are intended for those students who desire a "thorough course in Theoretical and Practical Mining," and underlying sciences, and leads to the degree of Bachelor of Science in Mining Engineering. The requirements for admission are the same as those for admission to the other Engineering Courses. Students who pursue these courses to their completion are expected to be able to undertake the "full management of mining in its various branches," and become familiar with the principles involved and the methods employed in good mining engineering practice in general.

The last course is designed for young men who have had some practical experience in mines, and wish to study mine surveying, drafting, the problems of ventilation, drainage, haulage, mine operation, etc., and also to learn something of the sciences which bear upon their work but have neither the time nor the preparation for a full college course. Elementary mathematics, drawing and shop work receive considerable attention during the first year, while the professional studies are reserved for the second year. Candidates who are twenty-one years of age or over are admitted without examination. All others must give evidence of a thorough grounding in the common branches.

Equipment.

The Department of Mining Engineering occupies six rooms on the third floor and three on the first floor of Engineering Hall and shares in common with the other Engineering departments the blue-print, photographic, Engineering Museum and Assembly rooms. Of the rooms used exclusively by the Department of Mining Engineering, three are used for laboratory purposes only, two for laboratory and lecture purposes, one as a museum, and three afford space for supplies, instruments, books and filing cases, *in addition to their use for* office purposes

Lecture Room and Laboratory in Mining Engineering.—This room is provided with seventy-five opera chairs with folding arm rests, a wall table cabinet occupying all of the outside wall space and so arranged as to provide excellent working space in front of the windows while the space between the windows is utilized for the filing of study material. Above the wall table, lockers with glass doors are provided, in which students may keep books and small pieces of apparatus free from dust. The windows are all provided with opaque shades and the room with a permanent lantern screen. The balance of the interior wall space is occupied by slate blackboards. A large cabinet lecture table completes the equipment of the room.

Seminar Room.—The seminar room is used for both laboratory and lecture purposes as in the case of the preceding, in addition to serving as a conference room and headquarters for the Junior and Senior students in Mining Engineering. It is equipped with two long tables standing at right angles to and directly connected with a large cabinet lecture table, the whole forming a continuous table in the form of a U. The room has a seating capacity of thirty-six and is equipped with movable revolving chairs, and slate blackboards on the interior walls. In addition the room contains a twenty-two tray filing case for large drawings, plats and maps, and a supply case.

Metallurgical Laboratories.—The laboratories for Metallurgy and Ceramics are located on the ground floor and are fitted with soapstone topped cabinet wall tables occupying all the outside walls and a large fume chamber, supply and display cases. They are supplied with water, gas, compressed air, exhaust and electrical connections. They already contain a Hoskin's No. 4 muffle furnace and a Bosworth assay furnace with the usual accessories for doing metallurgical and ceramic work and several smaller furnaces.

The department is supplied with a Sullivan core drill with a complete set of tools and accessories for carrying on actual field operations, a "Queen" Light Mountain mining transit; two "Berger" No. 4 Mining transits with interchangeable side and top telescopes; a Brunton pocket transit; a sensitive six-dial anemometer reading to ten millions of feet; rods and sighting poles; a set of miner's tools; barometers, clinometer, a series of miner's lamps and various instruments used in ascertaining distances.

The department has received through the generosity of the J. George Leyner Engineering Works, of Denver, Colorado, one Water Leyner Rock Drill with column, condenser, and full complement of steel.

The laboratory in Metallurgy possesses aside from the list of utensils to be found in any well equipped laboratory for these branches of chemical work, the following special pieces of apparatus: Weatherhead mortar and porcelain mortars for pulverizing; forty-four brass brickette molds, chemical balances, torsion balance; Le Chatelier thermo-electric pyrometer; a Seger volumeter; two-jar ball-mill, Sturtevant laboratory crusher; and sample grinder.

The Museum.—The museum for Geology and Mining Engineering is fitted with eight museum cases with sloping glass tops and cabinet bases. The bases supply room for one hundred and ninety-two trays in which the working collections and duplicate material in Geology and Mineralogy are filed. One large central case containing the larger casts of the "Ward Series," a series of cases, showcase tops and cabinet bases, occupy the space between the windows, and permanent cases occupy all the partition wall space.

The offices supply room for apparatus, supplies, books, and filing cases.

LOCATION.

Ames is located conveniently to the Iowa coal fields and students have easy access to the coal mines of Boone and Polk counties. The great centers of the clay industry, Des Moines, Boone, and Fort Dodge, are equally accessible, while the quarries of Marshall county are scarcely more than an hour's ride from the College. These and numerous allied industries are, after all, the most important and indispensable laboratories for the practical mining engineer. The department undertakes to present the accepted theories concerning mineral aggregation, origin and occurrence, but these theories can be put to test only by an intelligent use of the drill, the level and the plane table. The accredited methods of winning the ores and minerals receive full discussion in the class room, but only render obvious the necessity of becoming familiar with the practical workings of the sluice box, the tipple and the stamp mill. The chemical and physical properties of a clay may be ascertained in the laboratory, but a complete knowledge of its properties and its mode of treatment can be gained only by following it from the pit to the street. In short, the department aims to give as complete an exposition of the heories and laws which underlie the science of mining as the time vill permit, but the verification and application of these theories and aws must be made, in a large measure, in the field and in the industries.

Investigation Work.

It is the settled policy of the department to carry on such investiga- on work as may be of benefit to the mining and manufacturing interests of the state. In coöperation with the other Engineering departments considerable work has been done and is being done on fuels, clays and structural materials. The department is also prepared to do a limited amount of assaying, test clays and fuels, do mine surveying, prepare mine maps and plats, examine and report on mine and clay properties for citizens of the state at reasonable cost. In fact the atmosphere produced by *practical investigation work,* is believed to be necessary to the healthful growth of the engineer, and no opportunity is lost to encourage work along these lines.

Courses in Mining.

The work of the first two years in the four years' course in Mining Engineering is exactly the same as that required in the course in Mechanical Engineering, with the exception that Surveying takes the place of Mechanical Drawing, and the technical lecture is along mining engineering lines. The professional studies are given due prominence during the last two years of the course and the student is required to take continuous work in mining, chemistry and metallurgy, and geology, through the last three semesters. He is expected to make one of these branches the subject of special investigation and to embody the results of such investigation in a thesis, which is required of every student who is a candidate for graduation.

It is generally recognized that there is of necessity a considerable gap between the work included in the College curriculum and that of the professional engineer; and that the student in Engineering must gain the larger part of his professional training outside of college walls. The courses in summer field work are offered in the hope that his apprenticeship may be reduced to a minimum, and are required of all students in the four years' course in Mining Engineering.

COURSES IN MINING ENGINEERING.

Academic Year.

Any student who at entrance presents satisfactory credit for part o the Academic Course, or who by examination passes part of it satisfactorily, will be classified in such of the remaining work offered in th Academic year as the Dean of the Junior College and the Dean of Engineering shall consider will best prepare him for his college cours After providing in such classification for the remainder of the thirt credits required for entrance to college, the student may complet his schedule by taking up some of the Freshman studies.

FIRST SEMESTER.

		Required semeste hours
Mathematics 3	Algebra	5
English 2,	Rhetoric and Composition	5
Modern Languages		

The Language selected must be carried through the entire year.

Choice: Language 1, Language 5, Language 30,	French 5 German 5 Spanish 5	5
Civics 1,	Government in State and Nation	2
Mining Engineering 21,	Elements of Mining	1
	Total semester hours	18

SECOND SEMESTER.

		Required semester hours
Mathematics 5,	Plane Geometry	3
Mathematics 6,	Solid Geometry	2
Literature 12,	English Classics	4
Modern Languages		

The Language selected must be a continuation of the one chosen in the first semester.

Choice: Language 2, Language 6, Language 31,	French 5 German 5 Spanish 5	5
History 16,	The National Period	3
Mining Engineering 22,	Elements of Mining	1
	Total semester hours	18

FOUR YEAR COURSE IN MINING ENGINEERING.

This course leads to the degree of Bachelor of Science in Mining Engineering. Graduates from this course may receive the professional degree of Engineer of Mines by devoting an additional year to resident study and holding successfully a responsible engineering position for one year, on the presentation of a satisfactory thesis; or by five years' service in responsible engineering work and presentation of thesis.

N. B. ENGINEERING COURSE NUMBERS.—The number in hundreds place indicates the semester in which the subject is taught. If the subject is also taught in a previous semester, the true course number is followed by the descriptive course number in parenthesis.

**Freshman Year.

FIRST SEMESTER.

		Required semester hours
Mathematics 20,	Algebra	4
Mathematics 21,	Plane Trigonometry	1
Modern Languages		

**Freshmen who show deficient preparation in English or Mathematics may be ssigned by the Dean of the Junior College and the Dean of Engineering to special lasses, with one credit hour more work than indicated above, or in case of clear indi- ation of failure, even with this arrangement, they may be assigned to Academic asses.

The Language selected must be carried through the entire year.

Choice: Langage 18 or 57, Language 20 or 73, Language 36 or 45,	French 3 German 3 Spanish 3	3
English 10,	Narration and Description	3
Chemistry 41,	General Chemistry	3
Mechanical Engineering 130,	Shop Work	2
Mining Engineering 101,	Principles of Mining	
Mechanical Engineering 121,	Mechanical Drawing	2
Military 1,	Military Drill	
	Total semester hours	18

SECOND SEMESTER.

		Required semester hours
Mathematics 22,	Trigonometry	2
Mathematics 23,	Analytical Geometry	3
Modern Languages		

The Language selected must be a continuation of the one chosen in the first semester.

Choice: Language 19 or 58, Language 21 or 74, Language 37 or 46,	French 3 German 3 Spanish 3	3
English 11,	Exposition	3
Chemistry 42,	General Chemistry	3
Mechanical Engineering 231 (331),	Shop Work	2
Mining Engineering 220,	Principles of Mining	
Mechanical Engineering 220,	Descriptive Geometry	2
Military 2,	Military Drill	
Mining Engineering 212,	Summer field work	

Students who secure remunerative employment during their summer vacations between Freshman-Sophomore and Sophomore-Junior years will be excused from summer field work providing they are so employed for one month, subject to the approval of the heads of the department.

Total semester hours 18

Sophomore Year.

THIRD SEMESTER.

		Required semest hours
Mathematics 24,	Analytical Geometry	2
Mathematics 25,	Calculus	3

English 12,	Argumentation	2
Chemistry 43,	Qualitative Analysis	3
Physics 303,	Mechanics and Heat	5
Civil Engineering 345,	Surveying	2
Mechanical Engineering 322,	Mechanical Drawing	1
Mining Engineering 318,	Journal Club	
Military 3, or Athletics		
	Total semester hours	18
History 17,	The American People	1

To be taken in Sophomore or Junior year.

FOURTH SEMESTER.

		Required semester hours
Mathematics 26,	Differential and Integral Calculus	4
Chemistry 46,	Elementary Quantitative Analysis	4
Physics 404,	Electricity and Magnetism and Light and Sound	5
Mechanical Engineering 401,	Analytical Mechanics	3
Civil Engineering 446,	Surveying	2
Mechanical Engineering 483,	Mechanical Drawing	1
Mining Engineering 419,	Journal Club	
Military 4, or Athletics		
Mining Engineering 423,	Summer field work	

Students who secure remunerative employment during their summer vacations between Freshman-Sophomore and Sophomore-Junior years will be excused from summer field work providing they are so employed for one month, subject to the approval of the heads of the department.

	Total semester hours	18
History 18,	American Statesmen	1

To be taken in Sophomore or Junior year.

Junior Year.

FIFTH SEMESTER.

		Required semester hours
Mechanical Engineering 502,	Analytical Mechanics	5
Mining Engineering 510,	Mine Surveying and Mining Law	4
Geology 501,	Geology	4
Chemistry 48,	Assaying	4

Mechanical Engineering 512,	Mechanical Engineering Laboratory	1
Mining Engineering 506,	Seminar	
	Total semester hours	18

Optional:

English 7,	Debating	1
History 7,	America in the Far East	2
Economic Science 9,	Outlines of Economics	3
Civics 7,	Comparative Government	2
Literature 13,	Literature	2

SIXTH SEMESTER.

		Required semester hours
Mechanical Engineering 686,	Analytical Mechanics	4
Geology 607,	Geology	4
Mining Engineering 614,	Metallurgy	3
Mining Engineering 602,	Principles of Mining	3
Civil Engineering 656,	Structural Engineering	3
Engineering 603,	Conservation of Natural Resources	1
Mining Engineering 607,	Seminar	
Mining Engineering 613,	Summer field work	

Junior students who secure instructive employment in one of the great metal mining districts of the country will be excused from the Junior summer field work, providing they are so employed for at least six weeks subject to the approval of the head of the department.

Total semester hours 18

Optional:

English 8,	Debating	1
History 9,	The Far Eastern Question	2
Economic Science 9,	Outlines of Economics	3
Economic Science 12,	Engineering Economics	2
Civics 7,	Comparative Government	2
Literature 14,	Literature	2

Senior Year.

SEVENTH SEMESTER.

		Required semeste hours
Mining Engineering 715,	Metallurgy	5
Mining Engineering 703,	Principles of Mining	3
Geology 704,	Geology	4
Mechanical Engineering 784,	Steam Engines and Boilers	2
Engineering 702,	Specifications and Contracts	1

Electrical Engineering 712,	Electric Power Transmission and Mining	3
Mining Engineering 708,	Seminar	
Mining Engineering	Thesis begun	
	Total semester hours	18

Optional:

English 7,	Debating	1
History 7,	America in the Far East	2
Economic Science 14,	Outlines of Economics	2
Economic Science 12,	Engineering Economics	2
Civics 7,	Comparative Government	2
Literature 13,	Literature	2

EIGHTH SEMESTER.

				Required semester hours
	Mining Engineering 804,	Mining		5
	Geology 805,	Geology		4
	Engineering 801,	History of Engineering		1
	Mechanical Engineering 809,	Cosstructive Engineering		3
	Thesis work			
Choice	Mining Engineering 816,	Special Work in Mining	5	5
	Mining Engineering 817,	Special Work in Metallurgy	5	
	Geology 808,	Special Work in Geology	5	
	Mining Engineering 809,	Seminar		
		Total semester hours		18

Optional:

English 8,	Debating	1
History 9,	The Far Eastern Question	2
Economic Science 12,	Engineering Economics	2
Civics 7,	Comparative Government	2
Literature 14,	Literature	2

TWO YEAR COURSE IN MINING ENGINEERING.

First Year.

FIRST SEMESTER.

		Required semester hours
Mathematics 3,	Algebra	5
Mathematics 5,	Plane Geometry	5
Chemistry 21,	Elementary Experimental Chemistry	5
Mechanical Engineering 121,	Mechanical Drawing	2

Mechanical Engineering 130,	Shop Work	2
Mining Engineering 101,	Principles of Mining	
	Total semester hours	19

SECOND SEMESTER.

		Required semester hours
Mathematics 6,	Solid Geometry	2
Mathematics 30,	Plane Trigonometry	3
Chemistry 23,	Elementary Experimental Chemistry	5
Mining Engineering 602,	Principles of Mining	3
Civil Engineering 204,	Descriptive Geometry	2
Mechanical Engineering 331,	Shop Work	2
Mining Engineering 220,	Principles of Mining	
	Total semester hours	17

Second Year.

FIRST SEMESTER.

		Required semester hours
Chemistry 48,	Assaying	4
Civil Engineering 345,	Surveying	2
Mining Engineering 703,	Principles of Mining	4
Physics 303,	Mechanics and Heat	5
Mining Engineering 506,	Seminar	
	Total semester hours	15

SECOND SEMESTER.

		Required semester hours
Civil Engineering 446,	Surveying	2
Mining Engineering 804,	Mining Engineering	4
Mining Engineering 614,	Metallurgy	4
Geology 501,	General Geology	4
Mechanical Engineering 423,	Mechanical Drawing	2
Mining Engineering 607,	Seminar	
	Total semester hours	16

FIVE YEAR COURSE IN MINING ENGINEERING.

The following five year course in Mining Engineering is offered i response to a demand for an engineering course giving the student a better education in the culture studies and the natural sciences together wit an opportunity to specialize along certain engineering lines not pos sible in the time available in the four year course of study. The course includes all of the work given in the four year course, and in addition affords opportunity to do more work along cultural and scientific lines during the first three years and to elect additional subjects given in the engineering departments during the last two years.

This course leads to the same degree granted to graduates of the four year course. A graduate of the five year course may obtain the full professional degree of Engineer of Mines after one year of responsible professional work and the presentation of a satisfactory thesis.

N. B. ENGINEERING COURSE NUMBERS.—The number in hundreds place indicates the semester in which the subject is taught. If the subject is also taught in a previous semester, the true course number is followed by the descriptive course number in parenthesis.

Freshman Year.

FIRST SEMESTER.

			Required semester hours
	Mathematics 20,	Algebra	4
	Mathematics 21,	Plane Trigonometry	1
	Modern Language		
	The Language selected must be continued through the year.		
Choice	Language 18 or 57,	French 3	
	Language 20 or 73,	German 3	3
	Language 36 or 45,	Spanish 3	
	English 10,	Narration and Description	3
	History 6,	French Revolution and XIXth Century	3
	Mechanical Engineering 121,	Mechanical Drawing	
	Mechanical Engineering 130,	Forge Work	2
	Mining Engineering 101,	Technical Lecture	
	Military 1,	Drill	
		Total semester hours	18

SECOND SEMESTER.

	Mathematics 22,	Trigonometry	2
	Mathematics 23,	Analytical Geometry	3
	Modern Language		
	The Language selected must be a continuation of the one chosen in the first semester.		
Choice	Language 19 or 58,	French 3	
	Language 21 or 74,	German 3	3
	Language 37 or 46,	Spanish 3	
	English 11,	Exposition	3
	Mechanical Engineering 220,	Descriptive Geometry	2
	Mechanical Engineering 231,	Wood Shop	2

History 4,	Division and Reunion, 1850 to 1879	3
Mining Engineering 220,	Technical Lecture	
Military 2,	Drill	
Mining Engineering 212,	Summer field work	
	Total semester hours	18

Sophomore Year.

THIRD SEMESTER.

		Required semester hours
Mathematics 24,	Analytical Geometry	2
Mathematics 25,	Calculus	3
English 12,	Argumentation	2
Chemistry 2,	General Chemistry	5
Civil Engineering 308,	Surveying	4
Mechanical Engineering 322,	Mechanical Drawing	1
Military 3, or Athletics		
Elective	Non-technical Work	1
	Total semester hours	18

FOURTH SEMESTER.

Mathematics 26,	Differential and Integral Calculus	4
English 13,	Advanced Composition	2
Chemistry 5,	Qualitative Analysis	5
Mechanical Engineering 423,	Mechanical Drawing	2
Civil Engineering 409,	Surveying	4
Military 4, or Atheletics		
Elective	Non-technical Work	1
Mining Engineering 423,	Summer field work	
	Total semester hours	18

Junior Year.

FIFTH SEMESTER.

		Required semester hours
Physics 503 (303),	Mechanics and Heat	5
Economic Science 9,	Outlines of Economics	3
Mining Engineering 510,	Mine Surveying	4
Chemistry 50,	Analytic Chemistry	5
Mechanical Engineering 583, (483),	Drawing	1
Mining Engineering 506,	Seminar	
	Total semester hours	18

SIXTH SEMESTER.

Physics 604 (404),	Electricity and Magnetism and Light and Sound	5
Economic Science 15,	Engineering Economics	3
Mechanical Engineering 601 (401),	Analytical Mechanics	3
Geology 607 (501),	Mineralogy	4
Mining Engineering 618,	Assaying	3
Mining Engineering 607 (507),	Seminar	
Mining Engineering 613,	Summer field work	
	Total semester hours	18

Senior Year.

FIRST SEMESTER.

		Required semester hours
Mechanical Engineering 702 (502),	Analytical Mechanics	5
Electrical Engineering 712,	Electric Power Transmission and Mining	3
Physics 723 (523),	Physical Laboratory	1
Geology 701 (501),	General Geology	4
Mining Engineering 708,	Seminar	
Elective		5
	Total semester hours	18

SECOND SEMESTER.

		Required semester hours
Mechanical Engineering 886 (686),	Analytical Mechanics	4
Civil Engineering 811 (611),	Structural Engineering	4
Geology 2	Stratagraphic and Historical Geology	3
Mining Engineering 802 (602),	Mining Engineering	3
Mining Engineering 814 (614),	Metallurgy	3
Mining Engineering 809,	Seminar	
Engineering 803 (603),	Conservation of Natural Resources	1
	Total semester hours	18

Post Senior Year.

FIRST SEMESTER.

		Required semester hours
Mining Engineering 903 (703),	Mining Engineering	4
Mechanical Engineering 984 (784),	Steam Engines and Boilers	2
Engineering 902 (702),	Specifications and Contracts	1
Geology 904 (704),	Petrologic Geology	4
Mining Engineering 915 (715),	Metallurgy	5
Elective		2
Mining Engineering 919,	Seminar	
	Total semester hours	18

SECOND SEMESTER.

		Required semester hours
Engineering 1001 (801),	History of Engineering	1
Civil Engineering 1022 (822),	Water Supply Engineering	3
Civil Engineering 1015 (615),	Engineering Laboratory	1
Geology 1005 (805),	Economic Geology	4
Mining Engineering 1017 (817),	Special Work in Mining, Metallurgy or Geology	5
Elective		4
Mining Engineering 1020,	Seminar	
	Total semester hours	18

COURSES IN MINING ENGINEERING.

A21. Elements of Mining. Mining Engineering and Ceramic Courses. One hour credit.

B22. Elements of Mining. Mining Engineering and Ceramic Courses. One hour credit.

101. Principles of Mining. Mining Engineering and Ceramic Courses, in connection with the required Shop Work. The student receives instruction in the general and elementary principles of minin in order that he may appreciate something of what he sees and hear before he makes a detailed study of prospecting, exploration, minin methods, and the various subjects included in Courses 602, 703 and 804 Special attention given to mining terms and local mining methods.

212. Summer Field Work in Mine Surveying. Two weeks wor required at the close of the Freshman year. The work is carried on i one of the coal mining districts of the state and comprises the complet survey of a mine and a thorough examination of the equipment and mod of operation of a typical mine for the district, and leads in the first place to a mine map, and in the second to a careful report on mine property accompanied by the necessary illustrations.

220. Principles of Mining. A continuation of Course 101. Mining Engineering and Ceramics Courses in connection with the required Shop Work. The Mining and Metallurgical operations to be seen while on the succeeding Summer Field Trip are studied with as much detail as the time and student's preparation permit.

318. Journal Club. Mining Engineering Course and Ceramics. The work consists of weekly conferences with one or more of the instructors in the department, in which the leading mining journals receive principal attention. Lectures are given occasionally on current topics and the students are encouraged to acquire the habit of reading the technical journals which are to be found on the library shelves.

419. Journal Club. Mining Engineering Course and Ceramics. See Course 318. Continuation of 318.

423. Summer Field Work in Mine Surveying. Two weeks work required at the close of the Sophomore year. The work is carried on in one of the coal mining districts of the state, and comprises the complete survey of a mine and a thorough examination of the equipment and mode of operation of a typical mine for the district, and leads in the first place to a mine map, and in the second to a careful report on mine property accompanied by the necessary illustrations.

506. Seminar. Mining Engineering Course and Ceramics. For the purpose of bringing together the Junior and Senior students and the members of the instructing corps for weekly conferences. A discussion of timely topics by the students.

510. Mine Surveying and Mining Law. Mining Engineering Course. Supplements the work in surveying taken in the Civil Engineering Department. Methods of surveying especially adapted to mines and tunnels. The use of the auxiliary telescope and the various problems met with in underground surveying are illustrated by means of problems taken from actual practice. Also Mineral Land Surveying. As the subject of Mineral Land Surveying necessarily requires some knowledge of the law relating to mining claims, the whole subject of Mining, Mineral and Geological Law is given a rapid review. While an exhaustive study of such laws is impossible the necessity of some knowledge of the law is impressed upon the student and he is shown where he can obtain information on the simpler questions. Recitations, four hours per week.

602. Principles of Mining. Mining Engineering Course. Study of methods employed in excavating, boring and shaft sinking, mining and the support of mine excavations; also critical study of methods employed in exploration, development and mine working in general. Recitations, three hours per week.

607. Seminar. Mining Engineering and Ceramics Courses. Continuation of Course 506.

613. Summer Field Work in the Study of Mine Operation and Equipment, and of Concentrating Plants. Four weeks' work required of students who have completed the Junior year. This course necessitates a visit to one of the great metal producing centers outside of the state. A careful study of mine properties is made, and a detailed report, properly illustrated by sketches and drawings, is required. A portion of the time is devoted to a study of ore dressing and concentrating plants.

614. Metallurgy. Mining Engineering and Ceramics Courses. Study of refractory materials, fluxes, fuels and furnaces and the metallurgy of iron and steel; also pyrometry, calorimetry, fire clays and coke; the various metallurgical furnaces studied from working drawings; also an introduction to the science of metallography. Recitations, three hours per week.

618. Assaying. Mining Engineering Five Year Course. Three hours credit.

703. Principles of Mining. Mining Engineering Course. Continuation of Course 602, with special reference to Mining Machinery. The subjects of Haulage, Hoisting, Ventilation, Air Compressors, etc., are studied with as much detail as time permits. Recitations, three hours per week.

708. Seminar. Mining Engineering Course and Ceramics. Continuation of Courses 506 and 607.

715. Metallurgy. Mining Engineering Course. Study of processes relating to copper, lead, silver and zinc. In the time alloted to the work, a study of metallurgy of all the metals could not be made satisfactorily, and it is deemed best to confine the work to the most important metals and the most important processes. Recitations, five hours per week.

804. Mining Engineering. Mining Engineering Course. Ore dressing, amalgamation, cyamdation, mine buildings and general equipment and administration of mines. Recitations and lectures, five hours per week.

809. Seminar. Mining Engineering Course and Ceramics. Continuation of Courses 506, 607 and 708.

816. Mining Engineering. Optional Mining Engineering Course. Mine Examinations and Reports, Mine Accounting, Mine Plant Design. A comparative study of Mine Plants, New Concentration Methods, etc. These and kindred subjects will be taken up though not all during any one year. Instruction by means of lectures, assigned reading and reports. After preliminary work of this character, the student will be required to make designs and reports covering given problems. Students electing this work will be expected to write their graduating theses on subjects introduced in this course. Five hours per week.

817. Metallurgy. Optional Mining Engineering Course. Intended for students who desire to specialize as much as possible in metallurgy. The subjects will be varied from year to year to suit the needs of the individual students. Instruction given by means of assigned readings conferences and reports carried on simultaneously with work in the laboratory. Those electing this work will be required to write their graduating theses on subjects introduced in this course. Five hours per week.

919. Seminar. Five Year Course in Mining Engineering.

1020. Seminar. Five Year Course in Mining Engineering.

COURSES IN GEOLOGY.

501. General Geology: Dynamic, Structural and Physiographic Geology. Mining Engineering Course and Ceramics, and elective Science and Agricultural Courses. This course includes a study of the principles which form the groundwork of the Science and is given by means of recitations, lectures, laboratory and field work. Counts four hours per week, three of which are devoted to recitations and lectures, and one to laboratory and field work. Prerequisites, one or more semesters each of Chemistry and Physics. Text-book, Scott's Introduction to Geology, 2nd edition.

607. Mineralogy. Mining and elective Science and Agriculture. The first half of the term is devoted to a study of the morphological and physical characters of crystalline substances, while the last half is devoted to descriptive and determinative mineralogy. The course counts four hours and consists of four two hour sessions. Prerequisites, elementary courses in Mathematics, Chemistry and Physics.

704. Petrologic and Advanced Structural Geology. Mining Engineering and Ceramics Courses, and elective Science and Agriculture. The first ten weeks of the term are devoted to the study of rocks, their origin, occurrence and association, and the last six weeks to a discussion of principles and problems in Structural Geology. The course counts four hours per week and includes three hours class work and one laboratory or field period per week. Prerequisites, Geology 501 or 803. Four hours credit.

803. Engineering Geology. Civil Engineering Course. The course includes a discussion of the fundamental principles of dynamic and structural geology and a study of the common minerals and rocks, especially those important in structural materials. Counts three hours per week and consists of recitations, lectures, laboratory and field work. Prerequisites, Elementary Chemistry, Mechanics and Heat. Text-book, Scott's Introduction to Geology, 2nd edition.

805. Economic Geology. Mining Engineering and Ceramics Courses and elective Science and Agricultural Courses. The first ten weeks includes a study of the non-metallics while the remainder of the term is devoted to a study of the ore deposits of the United States, Canada, and Mexico. Especial stress is put upon the principles which govern the mode of occurrence, association and origin of the leading economic products. Prerequisites, Geology 501 or 803, and 704. Counts four hours and consists of three recitations and one laboratory or field period per week. Four hours credit.

808. Thesis. Students in Mining Engineering electing to write a thesis in geology are required to take five hours special work in geology during the second semester Senior year. This special work may be along any one of the following lines: Economic Geology, Petrology, Dynamic Geology, Structural Geology, Metamorphism, Historical Geology or Stratagraphic Geology.

CERAMICS AND CLAY WORKING.

The Department of Ceramics is established in the College in response to a growing demand for instruction in the silicate industries. The continued development of the clay working interests and the notable recent expansion along all lines of the cement industry have created a demand for technically educated men who are equipped to take the lead in the utilization of the silicate raw materials. Inquiries for qualified men along these lines have come from various sources but at the present time the demand is far greater than the supply.

The term "Ceramics" has come to include within its scope the several phases of that branch of engineering which has to do with the investigation and development of all materials which enter into any of the silicate products. Besides clay and cement, therefore, glass-making, sandlime brick manufacture, and all mortar work into which natural silicates or silicate forming processes enter are properly embraced in the definition of the word.

The ceramic processes proper are pre-eminently a phase of chemical engineering and depend upon the principles of technical chemistry. Along with this application of chemical principles must go, however, a thorough familiarity with good mechanical engineering practice and in this line a knowledge of surveying and the principles of electricity is also essential. The ceramist must likewise possess a knowledge of geology which will enable him to intelligently prospect for raw materials and to take advantage of geological features in their utilization. An acquaintance with metallurgical principles, especially those relating to the value of fuels and their combustion and the properties of slags is indispensable, for upon the application of this knowledge may frequently depend the success, or failure of large enterprises.

It is the design of the course in Ceramics to prepare and equip engineers to (a) intelligently exploit deposits of suitable raw materials, (b) to comprehend and apply economical methods to the winning of such materials, (c) to design and put into operation plants for their utilization and, (d) to take responsible charge of any and all technical processes connected with the manufacture of the finished products. To accomplish this, not only are the principles laid down in the class room and theories explained but these principles and theories are verified and applied in the laboratory and in the field. Students are also required to study the methods employed in some of the leading establishments of the state and are encouraged to spend their vacations in practical work at some of these plants.

The Iowa Brick and Tile Association, while in session at Sioux City in 1899, passed a resolution requesting the trustees of the College to take up the investigation of the clays and the clay industries of the state. Similar resolutions were passed at each succeeding annual convention of the association. In 1906 both the Iowa Brick and Tile Assocation and the Iowa Cement Users Association passed resolutions favoring the establishment of a "School of Ceramics" and providing for the investigation of the raw materials available for the silicate industries. Each organization appointed a committee to take the matter before the legislature then in session and secure the necessary legislation.

After a conference of the joint committee in Des Moines the following bill was prepared, presented to the legislature, and passed by that body:

To provide for the establishment of a course of practical and scientific instruction and investigation in the art of clay working and ceramics including the manufacture and use of cements and allied industries in the Iowa State College of Agriculture and Mechanic Arts.

Section 1. Be it enacted by the general assembly of the State of Iowa that the Trustees of the Iowa State College of Agriculture and Mechanic Arts be, and are hereby required to establish in said college a department of ceramics for the technical and practical education of clay workers, cement manufacturers and other allied pursuits in all branches of those arts which exist in this state and can be profitably introduced and maintained in this state from the mineral resources thereof; including the geology and properties of clays, cement materials, fuels, and other minerals required, and the testing of the products thereof; also the manufacture of fire brick, pressed brick, paving brick, and the glazed and enameled brick of all kinds, of sewer pipe, drain tile, fire proofing and terra cotta, of pottery, porcelain, china, and other specialties; also including the details of the manufacture and uses of cement and the details of other allied industries.

Section 2. Be it further enacted, that the said College shall provide as a part of its Engineering Experiment Station work for the investigation of clays, cement materials, fuels, and other mineral resourses of the state with especial reference to their economic uses, and for the publication and dissemination of information useful to such industries and for testing the products thereof.

At the 1907 and 1908 meetings of the Brick and Tile Association and the Iowa Association of Cement Users, strong resolutions were again passed favoring the development of ceramic investigations and the support by the state of a department of instruction in this line of work.

In accordance with the spirit of the act establishing the department it is the desire to continue in coöperation with the Engineering Experiment Station the investigation of promising deposits of raw materials in different parts of the state. It is the policy of the department to serve the interests of the people of the state and to carry on such experiments as may seem required to determine the suitability of materials that appear to be available for any ceramic purpose.

Courses in Ceramics.

Two courses are offered in Ceramics; a two year and a four year course. The shorter course is the equivalent of the short course in Mining Engineering while the longer course is coördinate with the four year courses offered in Mechanical, Civil, Electrical, and Mining Engineering.

COURSE IN CERAMICS.

Academic Year.

Any student who at entrance presents satisfactory credit for part of the Academic Course, or who by examination passes part of it satisfactorily, will be classified in such of the remaining work offered in the Academic year as the Dean of the Junior College and the Dean of Engineering shall consider will best prepare him for his college course. After providing in such classification for the remainder of the thirty credits required for entrance to college, the student may complete his schedule by taking up some of the Freshman studies.

N. B. Engineering Course Numbers. The number in hundreds place indicates the semester in which the subject is taught. If the subject is also taught in a previous semester, the true course number is followed by the descriptive course number in parenthesis.

FIRST SEMESTER.

			Required semester hours
	Mathematics 3,	Algebra	5
	English 2,	Rhetoric and Composition	5
	Modern Languages		
	The Language selected must be carried through the entire year.		
Choice	Language 1,	French 5	5
	Language 5,	German 5	
	Language 30,	Spanish 5	
	Civics 1,	Government in State and Nation	2
	Mining Engineering 21,	Elements of Mining	1
		Total semester hours	18

SECOND SEMESTER.

			Required semester hours
	Mathematics 5,	Plane Geometry	3
	Mathematics 6,	Solid Geometry	2
	Literature 12,	English Classics	4
	Modern Languages The Language chosen must be a continuation of the one chosen is the first semester.		
Choice	Language 2,	French 5	5
	Language 6,	German 5	
	Language 31,	Spanish 5	
	History 16,	The National Period	3
	Mining Engineering 22,	Elements of Mining	1
		Total semester hours	18

**Freshman Year.

FIRST SEMESTER.

			Required semester hours
	Mathematics 20,	Algebra	4
	Mathematics 21,	Plane Trigonometry	1
	Modern Languages The Language selected must be continued through the entire year.		
Choice	Language 18 or 57,	French 3	3
	Language 20 or 73,	German 3	
	Language 36 or 45,	Spanish 3	
	English 10,	Narration and Description	3
	Chemistry 41,	General Chemistry	3
	Mechanical Engineering 130,	Shop Work	2
	Mechanical Engineering 121,	Mechanical Drawing	2
	Mining Engineering 101,	Principles of Mining	
	Military 1,	Military Drill	
		Total semester hours	18

SECOND SEMESTER.

Required semester hours

**Freshmen who show deficient preparation in English or Mathematics may be assigned by the Dean of the Junior College and the Dean of Engineering, to special classes, with one credit hour more work than indicated above, or in case of clear indication of failure, even with this arrangement, they may be assigned to Academic classes.

Mathematics 22,	Trigonometry	2
Mathematics 23,	Analytical Geometry	3
Modern Languages		

The Language selected must be a continuation of the one chosen in the first semester.

Choice		
Language 19 or 58,	French 3	3
Language 21 or 74,	German 3	
Language 37 or 46,	Spanish 3	
English 11,	Exposition	3
Chemistry 42,	General Chemistry	3
Mechanical Engineering 231 (331),	Shop Work	2
Mining Engineering 220,	Principles of Mining	
Mechanical Engineering 220,	Descriptive Geometry	2
Military 2,	Military Drill	
Mining Engineering 212,	Summer Field Work	

Students who secure remunerative employment in the silicate industries during their summer vacation will be excused from summer field work, providing they are so employed for one month, subject to the approval of the head of the department.

Total semester hours 18

Sophomore Year.

THIRD SEMESTER.

		Required semester hours
Mathematics 24,	Analytical Geometry	2
Mathematics 25,	Calculus	3
English 12,	Argumentation	2
Chemistry 43,	Qualitative Analysis	3
Physics 303,	Mechanics and Heat	5
Civil Engineering 345,	Surveying	2
Mechanical Engineering 322,	Mechanical Drawing	1
Mining Engineering 318,	Journal Club	
Military 3, or Athletics		
	Total semester hours	18
History 17,	The American People	1

To be taken in the Sophomore or Junior year.

FOURTH SEMESTER.

		Required semester hours
Mathematics 26,	Differential and Integral Calculus	4
Chemistry 46,	Elementary Quantitative Analysis	4
Physics 404,	Electricity and Magnetism and Light and Sound	5
Civil Engineering 446,	Surveying	2
Mechanical Engineering 401,	Analytical Mechanics	3
Mechanical Engineering 483,	Mechanical Drawing	1
Mining Engineering 419,	Journal Club	
Military 4, or Athletics		
Mining Engineering 423,	Summer Field Work	

Students who secure remunerative employment in the silicate industries during their summer vacation will be excused from summer field work, providing they are so employed for one month, subject to the approval of the head of the department.

	Total semester hours	19
History 18,	American Statesmen	1

To be taken in the Sophomore or Junior year.

Junior Year.

FIFTH SEMESTER.

		Required semester hours
Mechanical Engineering 502,	Analytical Mechanics	5
Ceramics 501,	Ceramic Chemistry	5
Geology 501,	General Geology	4
Mechanical Engineering 503,	Materials of Construction	3
Physics 523,	Physical Laboratory	1
Mining Engineering 506,	Seminar	
	Total semester hours	18
Optional:		
History 7,	America in the Far East	2
English 7,	Debating	1
Civics 7,	Comparative Government	2
Literature 13,	Literature	2

SIXTH SEMESTER.

		Required semester hours
Mechanical Engineering 686,	Analytical Mechanics	4
Ceramics 602,	Ceramics	5
Civil Engineering 656,	Structural Engineering	3
Mining Engineering 614,	Metallurgy	3
Engineering 603,	Conservation of Natural Resources	1
Mechanical Engineering 613,	Engineering Laboratory	1
Mining Engineering 607,	Seminar	
Mining Engineering 613,	Summer Field Work	

Junior students who secure instructive employment in one of the great clay working or cement manufacturing districts of the country will be excused from the Junior summer field work, providing they are so employed for at least six weeks, subject to the approval of the head of the department.

Total semester hours 17

Optional:

History 9,	Far Eastern Question	2
English 8,	Debating	1
Civics 7,	Comparative Government	2
Literature 14,	Literature	2

Senior Year.

SEVENTH SEMESTER,

		Required semester hours
Ceramics 704,	Ceramics	5
Ceramics 703,	Ceramic Chemistry	5
Geology 704,	Geology	4
Mechanical Engineering 784,	Steam Engines and Boilers	2
Engineering 702,	Specifications and Contracts	1
Ceramics 705,	Ceramics	1
Mining Engineering 708,	Seminar	

Total semester hours 18

Optional:

History 7,	America in the Far East	2
Civics 7,	Comparative Government	2
Economic Science 12,	Engineering Economics	2
Literature 13,	Literature	2

EIGHTH SEMESTER.

		Required semester hours
Ceramics 806,	Ceramics	5
Mechanical Engineering 809,	Constructive Engineering	3
Geology 805,	Geology	4
Engineering 801,	History of Engineering	1
Ceramics 807,	Special and Thesis	5
Mining Engineering 809,	Seminar	
	Total semester hours	18
Optional:		
History 9,	The Far Eastern Question	2
Civics 7,	Comparative Government	2
Economic Science 12,	Engineering Economics	2
Literature 14,	Literature	2

Two Year Course in Clay Working.

The short course in clay working is designed to accommodate men already engaged in practice who may not have at their disposal sufficient time to take the four year course or who may not have had the opportunity to prepare themselves to meet the entrance requirements to the long course. It aims to equip such persons for advancement by presenting the essential principles of the various operations involved in the production of clay wares. The several subjects treated in this course are arranged in sequential order and as far as possible the principles discussed in the classroom are verified in the laboratory and the field. The preliminary studies of the first year are essential as a foundation for the understanding and prosecution of the more specialized work of the last two semesters. This course is planned to render the same sort of service to clay-workers as does the two year course in Mining Engineering to practical miners.

TWO YEAR COURSE IN CLAY WORKING.

First Year.

FIRST SEMESTER.

		Required semester hours
Mathematics 3,	Algebra	5
Mathematics 5,	Plane Geometry	5
Chemistry 21,	Elementary Experimental Chemistry	5
Mechanical Engineering 121,	Mechanical Drawing	2

Mechanical Engineering 130,	Shop Work	2
Mining Engineering 101,	Principles of Mining	
	Total semester hours	19

SECOND SEMESTER.

		Required semester hours
Mathematics 6,	Solid Geometry	2
Mathematics 30,	Plane Trigonometry	3
Chemistry 23,	Elementary Experimental Chemistry	5
Ceramics 602,	Ceramics	4
Mechanical Engineering 220,	Descriptive Geometry	2
Mechanical Engineering 231 (331),	Shop Work	2
Mining Engineering 220,	Principles of Mining	
	Total semester hours	18

Second Year.

FIRST SEMESTER.

		Required semester hours
Ceramics 501,	Ceramic Chemistry	5
Ceramics 704,	Ceramics	5
Physics 303,	Mechanics and Heat	5
Civil Engineering 345,	Surveying	2
Mining Engineering 506,	Seminar	
	Total semester hours	17

SECOND SEMESTER.

		Required semester hours
Ceramics 703,	Ceramic Chemistry	5
Ceramics 806,	Ceramics	5
Geology 501,	General Geology	4
Civil Engineering 446,	Surveying	2
Mechanical Engineering 423,	Mechanical Drawing	2
Mining Engineering 607,	Seminar	
	Total semester hours	18

COURSES IN CERAMICS.

501. Ceramic Chemistry. Quantitative analysis of raw materials used in the clay and cement industries. Especial attention is given to silicate minerals, beginning with those of simpler composition and progressing as far as possible in the analysis of the more complex clays, feldspar, etc. Five hours credit. Recitations, two hours, and three laboratories per week.

602. Ceramics. Classification, properties and methods of winning clays and other materials used in the ceramic industries. Laboratory work in clay testing accompanying. Five hours in course in Ceramics and four hours in course in Clay Working.

703. Ceramic Chemistry. Course 501 continued. Rational analysis of clays and pottery bodies, chemical calculations. Five hours credit. Two recitations and three laboratories per week.

704. Ceramics. Manufacture of clay wares, including preparation of the clay, formation of the ware, drying and burning. Five lectures per week.

705. Ceramics. Visits to important clay and cement working centers. Careful study and written reports on the plants inspected. One hour credit.

806. Ceramics. Manufacture and technique of glazes, enamels, cements, and cement products. Five hours credit, Three recitations and two laboratories per week.

807. Ceramics. Quantitative analysis and compounding of bodies, glazes and cements. Special problems, some one of which shall be the basis for a thesis. Five hours credit. Two recitations and three laboratory periods per week.

SUMMARY ENGINEERING COURSES.

Mechanical Engineering Courses.

NOTE.—(The numbers after the hyphens indicate additional courses required of students taking the Five Year Course.)

		Four Year Course	Five Year Course
Chemistry	41 (3), 42 (3), 43 (3), 45 (2).	11	
	2 (5), 5 (5).		10
Civil Engineering	855 (2), -345 (2), 446 (2), 721 (3).	2	9
Economic Science	9 (3), -14 (3).	3	6
Electrical Engineering	610 (3), 717 (1), 815 (3), 818 (1).	8	
	610 (3), 720 (2), 815 (3), 818 (1).		9
Engineering	603 (1), 702 (1), 801 (1).	3	3
English	10 (3), 11 (3), 12 (2).	8	8

History 17 (1), 18 (1), -4 (3), 6 (3).	2	8
Mathematics 20 (4), 21 (1), 22 (2), 23 (3), 24 (2), 25 (3), 26 (4).	19	19
Mechanical Engineering 117 (R), 121 (2), 130 (2), 218 (R), 220 (2), 232 (2), 322 (1), 331 (2), 401 (3), 423 (2), 437 (1), 439 (1), 502 (5), 503 (3), 512 (1), 524 (1), 533 (2), 541 (2), 605 (3), 606 (5), 613 (1), 625 (1), 634 (2), 642 (1), 704 (3), 707 (2), 708 (3), 714 (1), 726 (2), 735 (2), 743 (R), 819 (3), 811 (4), 815 (1), 827 (3), 844 (R).	69	69
Military 1, 2, 3 or Athletics, 4 or Athletics	R	R
Modern Languages (3), (3).	6	6
Physics 303 (5), 404 (5), 506 (3), 523 (1), 615 (1).	15	15
Electives (2), (4), (2), (2), (3), (5).		18
Totals	146	180

Civil Engineering Courses.

Note.—(The numbers after the hyphens indicate additional courses required of students taking the Five Year Course.)

	Four Year Course	Five Year Course
Chemistry 41 (3), 49 (4).	7	
Chemistry 2 (5), 5 (5).		10
Civil Engineering 101 (1), 102 (2), 141 (R), 203 (1), 204 (2), 231 (R), 242 (R), 305 (1), 308 (4), 343 (R), 349 (1), 407 (1), 409 (4), 432 (R), 444 (R), 450 (1), 510 (5), 514 (1), 524 (2½), 527 (R), 603 (1), 611 (4), 615 (1), 617 (4), 628 (R), 633 (R), 653 (2), 712 (2), 716 (1), 718 (4), 721 (3), 723 (2), 725 (R), 729 (R), 819 (2), 820 (2), 822 (3), 826 (3), 830 (R).	61½	
For Five Year Course add 206 (1) and omit 603 (1).		61½
Choice: Civil Engineering 738 (3), 839 (3). Civil Engineering 754 (1), 834 (3). Mechanical Engineering 788 (2). Civil Engineering 735 (3), 836 (3).	6	
Economic Science 14 (2), -9 (3), 15 (3).	2	6
Electrical Engineering 503 (2).	2	2
Engineering 702 (1), 801 (1), -603 (1).	2	3
English 10 (3), 11 (3), 12 (2), -13 (2).	8	10
Geology 803 (3).	3	3
History 17 (1), 18 (1), -6 (3), 4 (3).	2	6
Mathematics 20 (4), 21 (1), 22 (2), 23 (3), 24 (2), 25 (3), 26 (4), 27 (1½).	20½	20½
Mechanical Engineering 181 (1), 401 (3), 502 (5), 686 (4), 784 (2).	15	15

Military 1, 2, 3 or Athletics, 4 or Athletics	R	R
Modern Languages (3), (3).	6	6
Physics 303 (5), 404 (5), 523 (1).	11	11
Eelectives (2), (3), (4), (5), (4), (2), (3), (3).		26
Totals	146	180

Electrical Engineering Courses.

NOTE.—(The numbers after the hyphens indicate additional courses required of students taking the Five Year Course.)

	Four Year Course	Five Year Course
Chemistry 41 (3), 42 (3), 43 (3), 45 (2).	11	
Chemistry 2 (5), 5 (5).		10
Civics 6 (3).		3
Civil Engineering 751 (3).	3	
Civil Engineering 345 (2), 446 (2).		4
Economic Science 9 (3), -12 (3).	3	6
Electrical Engineering 101 (R), 202 (R), 604 (4), 619 (1), 708 (4), 713 (1), 720 (2), 724 (2), 729 (R), 809 (3), 816 (3), 821 (2), 825 (2), 830 (R), 840 (4).	28	
For the Five Year Course omit 713 (1).		27
Engineering 603 (1), 702 (1), 801 (1).	3	3
English 10 (3), 11 (3), 12 (2), -13 (2).	8	10
Geology 501 (4).		4
History 17 (1), 18 (1), -4 (3), 6 (3).	2	8
Literature 13 (2), 14 (2).		4
Mathematics 10 (2), 20 (4), 21 (1), 22 (2), 23 (3), 24 (2), 25 (3), 26 (4).	21	21
Mechanical Engineering 121 (2), 130 (2), 220 (2), 232 (2), 322 (1), 331 (2), 401 (3), 423 (2), 437 (1), 439 (1), 502 (5), 503 (3), 512 (1), 533 (2), 613 (1), 686 (4), 689 (2), 784 (2), 809 (3).	41	
For the Five Year Course add 634 (2), 605 (2), 606 (4), and omit 686 (4), 689 (2), 809 (3).		40
Military 1, 2, 3 or Athletics, 4 or Athletics.	R	R
Modern Languages (3), (3).	6	6
Physics 303 (5), 404 (5), 506 (3), 514 (2), 607 (3), 617 (2).	20	20
Electives (2), (2), (4), (3), (3).		14
Totals	146	180

Mining Engineering Courses.

NOTE.—(The numbers after the hyphens indicate additional courses required of students taking the Five Year Course.)

		Four Year Course	Five Year Course
Chemistry	41 (3), 42 (3), 43 (3), 46 (4), 48 (4).	17	
	2 (5), 5 (5), 50 (5).		15
Cicil Engineering	345 (2), 446 (2), 656 (3).	7	
	308 (4), 409 (4), 611 (4), 822 (3), 615 (1).		16
Economic Science	9 (3), 15 (3).		6
Electrical Engineering	712 (3).	3	3
Engineering	603 (1), 702 (1), 801 (1).	3	3
English	10 (3), 11 (3), 12 (2), -13 (2).	8	10
Geology	501 (4), 607 (4), 704 (4), 805 (4), -2 (3).	16	19
History	17 (1), 18 (1).	2	
	6 (3), 4 (3).		6
Mathematics	20 (4), 21 (1), 22 (2), 23 (3), 24 (2), 25 (3), 26 (4).	19	19
Mechanical Engineering	121 (2), 130 (2), 231 (2), 220 (2), 322 (1), 401 (3), 483 (1), 502 (5), 512 (1), 686 (4), 784 (2), 809 (3).	28	
For Five Year Course add 423 (2), and omit 512 (1), 809 (3).			26
Military	1, 2, 3 or Athletics, 4 or Athletics.	R	R
Mining Engineering	101 (R), 220 (R), 212 (R), 318 (R), 419 (R), 510 (4), 506 (R), 602 (3), 614 (3), 607 (R), 613 (R), 715 (5), 703 (3), 708 (R), 804 (5), 809 (R).	23	
For Five Year Course add 618 (3), 919 (R), 817 (5), 1020 (R), and omit 804 (5).			26
Modern Languages	(3), (3).	6	6
Physics	303 (5), 404 (5), -523 (1).	10	11
Thesis	Mining Engineering 816 (5). Mining Engineering 817 (5). Geology 808 (5).	5	
Electives	(1), (1), (5), (3), (4).		14
Totals		147	1

Ceramics Course.

Ceramics 501 (5), 602 (5), 703 (5), 704 (5), 705 (1), 806 (5), 807 (5).	31
Chemistry 41 (3), 42 (3), 43 (3), 46 (4).	13
Civil Engineering 345 (2), 446 (2), 656 (3).	7
Engineering 603 (1), 702 (1), 801 (1).	3
English 10 (3), 11 (3), 12 (2).	8
Geology 501 (5), 704 (4), 805 (4).	13
History 17 (1), 18 (1).	2
Mathematics 20 (4), 21 (1), 22 (2), 23 (3), 24 (2), 25 (3), 26 (4).	19
Mechanical Engineering 121 (2), 130 (2), 220 (2), 331 (2), 322 (1), 401 (3), 483 (1), 502 (5), 503 (3), 613 (1), 686 (4), 784 (2), 809 (3).	31
Military 1, 2, 3 or Athletics, 4 or Athletics	R
Mining Engineering 101 (R), 220 (R), 212 (R), 318 (R), 419 (R), 423 (R), 506 (R), 607 (R), 613 (R), 614 (3), 708 (R), 809 (R).	3
Modern Language (3), (3).	6
Physics 303 (5), 404 (5), 523 (1).	11
Total	147

Engineering Experiment Station

Engineering Experiment Station

While the principal business of the several Engineering departments of the College is perhaps to give instruction to their students, the fact is recognized that the state contributes largely to the financial support of the College and that in return, not only should the College give tuition to the youth of Iowa, but it should contribute as much as possible to the successful carrying on of the industrial interests of the state. By the establishment of experiment stations the national government has recognized the duty of the land grant colleges to the agricultural interests. The Engineering departments of this College believe that it is their proper business to aid the other industrial enterprises of the state.

With this thought as the motive, the several Engineering departments have undertaken during the past twelve years and will continue in the future to undertake to carry on investigations of interest and value to the industries of Iowa, as need therefor may arise, in so far as the funds available will permit. A number of pamphlets and bulletins giving the results of some of these investigations have already been published, and have been received with much favor by the people of the state. By strong resolutions numerous industrial and public organizations in Iowa have expressed their approval of this work.

In recognition and furtherance of this work the 31st General Assembly has appropriated a specific annual sum for the establishment of an Engineering Experiment Station, for carrying on and publishing bulletins of investigations of value to the industrial and municipal interests of Iowa.

Work of the Engineering Experiment Station.

One of the most important lines of investigation already undertaken is sewage disposal. The first sewage disposal plant in Iowa was constructed at the College in 1898 and has been in highly successful operation ever since. The authorities of many cities in the state have visited it. The College is continually carrying on investigations in sewage disposal, both with the large plant and with smaller experimental plants. Among the special subjects now being investigated may be mentioned those of the disposal of creamery sewage. and small plants, built for less than $100 each, for disposing of the sewage of private houses.

In addition a representative of the Engineering Experiment Station each year visits all the sewage disposal plants of the state, making tests of the efficiency and securing the data of the operation of the plants. The results of these examinations and of other investigations are published in bulletin form for free distribution.

Another line of investigation has been tests of building materials, which have also been under way for several years. Thousands of such tests, of all kinds of building materials in Iowa, have been made and the results published for the benefit both of the manufacturers and the consumers of the state.

Investigations helpful to the clay interests of the state have been under way for some years, and additional equipment is being put in for this work. Opportunity is provided whereby anyone can send to the Experiment Station samples of clay, to be tested as to suitability for material for brick, tile or other clay wares.

During past years the Mining Engineering Section of the Station has been engaged in careful investigation of cement materials of the state. A very large number of samples of materials have been sent in from different parts of the state and have been carefully analyzed and studied as to their availability as cement materials. This work has been done in coöperation with the State Geological Survey.

The investigations of Iowa coals have been of much value to the manufacturers and to the mining interests of the state, as has been shown by the large demand for the bulletin already published. This work is being continued and largely extended.

It is planned to conduct a statistical inquiry of the power plants of the state, with personal examination of each plant and study its conditions. The results of this investigation will be helpful in suggesting improvements in methods and systems in Iowa power plants.

Careful tests of electric lamps have been made a special feature of the Engineering Experiment Station work. Any city or corporation can now send its lamps to the station (which has been made the official testing station of the Iowa Electrical Association) and have careful tests of efficiency, candle power and durability made at short notice and slight cost, and thus determine whether it is getting proper return for the money paid for its lamps. Many such lamps are being sent in, and in addition special investigations along this line are being conducted, the results of which will be published in bulletin form.

An investigation of the properties of Iowa limes as compared with those from other states has been completed, and a bulletin of the results published.

During the past year especial attention has been given to investigation along the line of drainage engineering. Up to the present time data did not exist by which drainage engineers can compute the sizes of ditches and drains required under different conditions in this state, and, undoubtedly, very large sums of money are being wasted on account of mistakes in drainage engineering. For two years we have been making gaugings of the actual flow of tile in our drainage systems and have secured important results during the past year which are to be published immediately in bulletin form.

In addition, the Engineering Experiment Station has been engaged in making very extensive investigations of the merits and defects of cement drain tile as compared with clay drain tile and has accummulated a large mass of data on the subject. A bulletin on this subject is to be published in the immediate future.

The above is only a part of the work done or planned by the Engineering Experiment Station.

TESTS OF MATERIALS.

More and more the cities and other public bodies of the state, together with private corporations, are sending in samples of various materials to be tested in the laboratories of the Engineering Experiment Station.

Many places are having their cements tested to see whether they are up to specifications.

The same is true of brick, both for paving and building purposes.

Steel, iron, stone, wood, and other materials of construction can be sent in for tests to advantage.

Users of cement are sending samples of their sands for tests, to select the best.

Many samples of clay are received for analysis, test, and report as to value.

Many samples of cement and clay drain tile and sewer pipe are submitted for tests.

Ores are received for assaying work.

Coal can be sent in for test of its calorific value for fuel, and the absence of deleterious elements.

Electric lamps are being sent in by many cities and corporations for test to decide whether they are up to the representations on which they were bought.

All such testing work for the people of Iowa is done at bare cost. We invite further work of this kind, and promise our best efforts to be of assistance to all residents of the state along these and similar lines.

List of Engineering Experiment Station Bulletins

Bulletin No. 1.—The Iowa State College Sewage Disposal Plant and Investigations. (Now out of print.) This bulletin describes the College plant, the first in the state, and gives the results of the first year of operation, including bacterial and chemical analysis. 21 pgs., 6 cuts.

Bulletin No. 2.—Bacteriological Investigations of the Iowa State College Sewage. (Now out of print.) Results from Sept. 1, 1899, to Sept. 1, 1900. 22 pgs.

Bulletin No. 3.—Data of Iowa Sewage and Sewage Disposal. (Now out of print.) This bulletin gives a number of gaugings and analyses of Iowa sewage from different towns, and of various kinds, together with the detailed results of the operation of the College sewage disposal plant from May, 1900, to May, 1901. 27 pgs., 5 cuts.

Bulletin No. 4.—Bacteriological Investigations of the Iowa State College Sewage Disposal Plant. (Now out of print). Results from 1898 to 1902. 19 pgs., 3 plates.

Bulletin No. 5.—Chemical Composition of the Sewage in the Iowa State College Sewage Disposal Plant. (Now out of print.) By J. B. Weems, J. C. Brown, and R. C. Myers.

Bulletin No. 6.—Tests of Iowa Common Brick. (Now out of print.) This bulletin gives the results of several hundred tests of seven different varieties of common brick manufactured in Iowa. Crushing, transverse breaking, absorption and freezing and thawing tests are given in each case. 23 pgs., 28 cuts.

Bulletin No. 7.—Sewage Disposal in Iowa. (Now out of print.) This bulletin gives detailed descriptions, usually with plans, of all sewage disposal plants in Iowa up to December, 1903, with the history of sewage disposal in the state, and full details of the operation of the several plants, including chemical and bacterial tests of efficiency. This paper was awarded the Fuertes Medal by Cornell University, June, 1904, and the Chanute Medal of the Western Society of Engineers for 1903.

Bulletin No. 8.—This bulletin gives the results of several hundred tests of seven varieties of dry press brick commonly used in Iowa. Crushing, transverse breaking, absorption and freezing and thawing tests are given in each case. 19 pgs., 8 cuts.

Bulletin No. 9.—Notes on Steam Generation with Iowa Coal.. (Now out of print.) This bulletin gives a summary of a number of analyses of Iowa coal and tests of their heating power, together with a discussion of the special difficulties encountered in burning Iowa coals and the best methods of overcoming these difficulties. 16 pgs., 3 cuts.

Bulletin No. 10.—Dredging by the Hydraulic Method, by George W. Catt, President of the Atlantic, Gulf and Pacific Dredging Co.

Bulletin No. 11.—An Investigation of Some Iowa Sewage Disposal Systems (Now out of print), by L. H. Pammel and J. B. Weems.

At this point the form of the bulletin was changed to a periodical published six times a year and the system of numbering the issues was changed accordingly.

Volume II, No. 6.—The Good Roads Problem in Iowa. This was the first bulletin published by the Iowa State Highway Commission and it gives a general discussion of the good roads problem in Iowa with instructions for building concrete culverts and for making King road drags.

Volume III, No. 1.—Tests of Cement. This bulletin gives a general discussion of the properties of cement, together with the results of several hundred tests made in the laboratory of the Engineering Experiment Station. Standard specifications for cement are also given.

Volume III, No. 2.—State Railroad Taxation. This is a discussion by Professor F. C. French, Associate Professor of Railway Engineering at the Iowa State College, on the different methods which are employed in taxing railways.

Volume III, No. 3.—Steam Generation With Iowa Coals. This bulletin reports the results of a number of investigations on mechanical stokers with Iowa coals, together with a summary of the results of the government tests on Iowa coals, hand fired. By Professors G. W. Bissell and W. H. Meeker.

Volume III, No. 4.—Incandescent Lamp Testing. This bulletin gives a comparison of the various kinds of incandescent lamps which are on the market, with respect to their initial candle powers and efficiencies and a determination of the ratio between the mean spherical and horizontal candle powers.

Volume III, No. 5.—Steam Pipe Covering Tests, with a special object of determining the value of steam pipe coverings of varying thicknesses, based upon the results of these tests and compiled by Professor Wilson.

Volume III, No. 6.—Assessments of Drainage Districts. This bulletin gives a detailed discussion by an experienced drainage engineer of proper method in accordance with Iowa law, assessing cost of drainage improvements upon the property owners of the district in proportion to the benefits. The bulletin is by Professor L. E. Ashbaugh.

Volume IV, No. 1.—Tests of Iowa Limes. Results of tests of the tensile strength of several standard brands of Iowa limes with varying proportions of sand and for varying periods of setting and hardening.

Volume IV, No. 2.—The Holding Power of Nails. This bulletin gives some of the results of a series of tests of nails in different kinds of woods when subjected to single shear direct pull.

Volume IV, No. 3.—The Effects of Coloring and Waterproofing on the Strength and Permeability of Cement Blocks.—The Improvement of Cement Mortal by Grading the Size of the Same.—Tests of the Impermeability of Reinforced Concrete Pipes.

Volume IV, No. 4.—Tests and Other Investigations of Cement Drain Tile and Sewer Pipe.

Volume IV, No. 5.—The Results of Some Drainage Investigations in Iowa, with especial reference to the flow of water in drain tile and the size of tile required for different drainage districts.

Bulletins Nos. 2, 4, and 5, of Volume 4, are not yet in print, but most of the material for them is ready and we expect to have them published immediately.

Any of the above bulletins of which the supply is not exhausted can be obtained by writing to A. Marston, Director, Ames, Iowa.

IOWA STATE HIGHWAY COMMISSION.

A. MARSTON,
C. F. CURTISS,
Directors.

THOS. H. MACDONALD,
Highway Engineer.

J. B. DAVIDSON,
Engineer of Road Machinery.

J. E. KIRKHAM,
Consulting Bridge Engineer.

C. S. NICHOLS,
Secretary.

Establishment of the Commission.

By act of the 30th General Assembly the College was constituted the State Highway Commission of Iowa and a small appropriation was made for road investigation and experimentation. It was made the duty of the Commission to obtain data from the counties and townships relating to road conditions; to furnish expert assistance to the several counties when called upon by the proper county officials; to prepare standard plans and specifications for road and bridge work, and to conduct each year a school of instruction for road workers at the College.

The 31st General Assembly increased the appropriation for the work and placed it on an annual basis.

Work of the Commission.

Since July, 1904, the Commission has been actively engaged in carrying out the provisions of the law as outlined above. A large amount of general and detailed information has been collected in various ways. In the 1905 census a supplementary card called the Agricultural Road Schedule was added and in this way complete detailed figures secured of the amount of traffic over the country roads from each farm. The results from several counties which have been worked up so far give promise of amazing totals for the entire state.

A number of tests of both stone and gravel for road material have been made in the Road Materials Laboratory and these tests will be continued to cover all the principal deposits in the state. Such material when sent in by road officials is tested free of charge. There has been a considerable demand for both the standard cross sections of roads and the plans of concrete bridges which have been developed by the Commission. No attempt, however, is made to make certain standard structures fit all places, and whenever it is necessary a personal visit is made to the county and plans made after all information available has been secured.

Quite a representative line of machinery has been placed at the College by the companies manufacturing the different kinds. Short stretches of experimental gravel and stone roads have been constructed.

School of Instruction for Road Officers.

The first school for road officers was held in June, 1905, the second in August, 1906, the third in September, 1907, and the fourth in August, 1908,. Regular instruction is given in road grading, culvert and bridge building, road laws, and such subjects as are of pertinent interest to road men generally. Each county and township board is urged to pay the expenses of at least one representative, as it is felt the experience gained and the new ideas acquired will prove of much value in the local work.

Bulletins Published.

Such material as was of value has been incorporated in the various publications of the Commission.

"The Good Roads Problem in Iowa" takes up the subject from a broad general standpoint. It points out the general ways in which the road money is handled and the saving that could be effected with some system applied to this work. This bulletin was issued before much detailed information was available.

"The Manual for Highway Officers" is a 102-page booklet, containing a digest of the road laws; information in regard to the general topographic features as they affect road building; ways and methods of road building and maintenances and plans and instructions for the use of concrete in culverts and bridges.

"The Annual Report of the Iowa Highway Commission, 1904-5." A pamphlet of 75 pages giving a detailed report of the operations of the Commission with an itemized statement of expenditures. The subjects for legislation were also discussed.

"1906 Revision, Manual for Highway Officers." The Manual was revised entirely in 1906 and much new material added. The new material added is chiefly along the lines of road construction and the use of concrete.

"1907 Report." The second annual report. The general subjects are the same as for the first report.

"Road Improvement in 1908." A short bulletin containing practical suggestions relative to road dragging, drainage, culvert building, and maintenance, for road workers.

"The Annual Reports of the Iowa Highway Comimssion," for the years 1906-7 and 1907-8 incorporated in biennial report. A third report of the Commission containing an outline and suggested legislation for developing a practical administrative system; a summary of work accomplished during the existence of the Commission; financial reports; road laws, and comparative sections of roads built in other states.

All of these publications can be obtained by writing to the Commission.

The aim of the Highway Commission is to build up an engineering and advisory bureau to furnish practical aid to the counties and at the same time to carry on experiments and demonstrations of educational and scientific value.

During the past two years the calls for aid from various counties have increased rapidly. The work handled during the past year has varied from small concrete culverts up to the Des Moines River bridges at Kilbourn and Cliffland, plans and specifications for which were prepared by the Commission, the supervision of the actual work being under inspectors reporting to the Commission.

Division of Science as Related to the Industries

Division of Science as Related to the Industries

Many of the courses of study taught in this Division form a very essential part of those belonging to the other Divisions, so that the work required for the various degrees conferred by the College authorities is very thoroughly interwoven.

The object of the work in this Division is very comprehensively expressed in the act of Congress establishing this and similar colleges. The founding of these colleges on a basis of scientific learning has proved to be the beginning of an important epoch in educational history. The courses of study in this Division are less technical than are many of those of the other Divisions. The real advances in modern civilization have been along the lines of science study and investigations. It is the intent, therefore, to lay a broad foundation in scientific facts and principles in order to fit the graduate to fill his place in the affairs of the world. There can be no better preparation for the duties of life and for citizenship than the knowledge and mental training given by a genuine study of the sciences.

During the first two years the lines of study are well marked out and but little choice of subjects is given. The required mathematics end with the Freshman year. The subject may be pursued, however, during the remainder of the course, provided the student desires and is qualified to do so.

The various branches of the study of the English language extending throughout the Freshman and Sophomore years are sufficient in scope and purpose to give the needed training in the use of English. The modern languages, namely, French, German and Spanish, are great storehouses of the sciences, and consequently courses of study in these languages are offered to the student in the earlier years of his work to enable him to use these languages in the last two years of his study. The study of the sciences is strongly supported by work in literary, historical and psychological lines.

The course in General Science leads to the degree of Bachelor of Science (B. S.).

The course in Domestic Economy leads to the degree of Bachelor of Science in Domestic Economy (B. S. in D. E.).

COURSE IN GENERAL SCIENCE.

Academic Year.

Any student who at entrance presents satisfactory credit for part of the Academic Course, or who by examination passes part of it satisfactorily, will be classified in such of the remaining work offered in the

Academic year as the Dean of the Junior College and the Dean of the Science Division shall consider will best prepare him for his college course. After providing in such classification for the remainder of the thirty credits required for entrance to college, the student may complete his schedule by taking up some of the Freshman studies.

A SEMESTER.

			Required semester hours
	Mathematics 3,	Algebra	5
	English 2,	Rhetoric and Composition	5
	Modern Languages		
	The Language selected must be carried through the entire year.		
Choice	Language 1,	French 5	5
	Language 5,	German 5	
	Language 30,	Spanish 5	
	Civics 8,	Government in State and Nation	3
		Total semester hours	18

B SEMESTER.

			Required semester hours
	Mathematics 5,	Plane Geometry	5
	Literature 9,	English Classics	5
	Modern Languages		
	The Language selected must be a continuation of the one chosen at the beginning of the Academic year.		
Choice	Language 2,	French 5	5
	Language 6,	German 5	
	Language 31,	Spanish 5	
	History 2,	Advanced American	4
		Total semester hours	19

**Freshman Year.

FIRST SEMESTER.

Required semester hours

Science:

Students who take Botany or Zoology in the Freshman year will be required to take Chemistry 2, or Physics 301 or

---

**Freshmen who show deficient preparation in English or Mathematics may be assigned by the Dean of the Junior College and the Dean of Science, to special classes, with one credit hour more work than indicated above, or in case of clear indication of failure, even with this arrangement, they may be assigned to Academic classes.

303, in the Sophomore year. Students who take Chemistry in the Freshman year will be required to take Botany 27, or Zoology 2, in the Sophomore year.

The science chosen must be continued through the entire Freshman year.

Choice	Botany 27,	General Botany	5	5
	Chemistry 2,	General Chemistry	5	
	Zoology 2,	General Zoology	5	
	Mathematics 4,	College Algebra		5
	English 10,	Narration and Description		3

Modern Languages:

The Language selected must be carried through the entire year.

Choice	Language 3,	French	5	5
	Language 7,	German	5	
	Language 32,	Spanish	5	

Fully accredited students who have presented for admission four credits in Latin will take Modern Language 1, 5, or 30.

Military 1 (for men),	Military Drill	
Physical Culture 1 (for women),	Marching Tactics	
Library 1,	Library work (four hours per semester)	
	Total semester hours	18

SECOND SEMESTER.

Required semester hours

Science:

The science selected must be a continuation of the one chosen at the beginning of the Freshman year.

Choice	Botany 28,	General Botany	5	5
	Chemistry 5,	Qualitative Analysis	5	
	Zoology 3,	General Zoology	5	
	Mathematics 6,	Solid Geometry		2
	Mathematics 30,	Plane Trigonometry		3
	English 11,	Exposition		3

Modern Languages:

The Language selected must be a continuation of the one chosen at the beginning of the Freshman year.

Choice	Language 50,	French	3	3
	Language 26,	German	3	
	Language 38,	Spanish	3	

Those who took Language 1, 5, or 30 in first semester Freshman will continue with Language 54, 29, or 42.

History 5,	Europe in the XVIth, XVIIth, and XVIIIth Centuries	3
Military 2 (for men),	Military Drill	
Physical Culture 2 (for women),	Calisthenics	
	Total semester hours	19

Sophomore Year.

THIRD SEMESTER.

				Required semester hours	
English 12,		Argumentation		2	2
*Botany	27,	General Botany	5		
	30,	Bacteriology	4		
	4,	Cryptogamic Botany	5		
*Chemistry	2,	General Chemistry	5		
	11,	Quantitative Analysis	5		
*Mathematics 8,		Plane Analytical Geometry	5		
*Physics	301,	Mechanics and Heat	3		
	303,	Mechanics and Heat	5		
*Zoology	2,	General Zoology	5		
	5,	Embryology	5		
History 6,		French Revolution and XIXth Century	3	16 to 18	
Modern Languages: The student may continue the Language taken in the Freshman year.					
Language 51,		French	3		
Language 27,		German	3		
Language 39,		Spanish	3		
Those who took Language 54, 29, or 42 in second semester Freshman will take Language 55, 71, or 43.					
Public Speaking 2,		The Declamation	1		
Domestic Economy 1 (for women),		Clothing	2		
Miliary 3, or Athletics (for men)					
Physical Culture 3 (for women),		Light Apparatus			
		Total semester hours		18 to 20	

Rules for the selection of studies in this semester.

1. Students who take Botany or Zoology in the Freshman year will be required to take Chemistry 2, or Physics

301 or 303, in the Sophomore year. Students who take Chemistry in the Freshman year will be required to take Botany 27, or Zoology 2, in the Sophomore year.

2. Not less than 8 hours of the starred (*) subjects must be selected.

3. Not more than 5 hours can be taken in any department.

4. Any beginning science chosen must be carried through the year.

FOURTH SEMESTER.

Any beginning science of first semester Sophomore year, must be continued through this semester.

			Required semester hours	
*Botany	28,	General Botany	5	18 to 20
	12,	Vegetable Cytology	5	
	15,	Systematic Phanerogams	5	
*Chemistry	5,	Qualitative Analysis	5	
	9,	Organic Chemistry	5	
*Mathematics	9,	Differential and Integral Calculus	5	
*Physics	402,	Electricity and Magnetism and Light and Sound	3	
	404,	Electricity and Magnetism and Light and Sound	5	
*Zoology	3,	General Zoology	5	
	7,	Comparative Anatomy	5	
	14,	Advanced Invertebrate Zoology	3	
Civics	6,	Actual Government	3	
Literature	2,	Epic and Lyric Poetry	5	
The student may continue the Language taken in the first semester Sophomore.				
Modern Languages:				
Language	52,	French	3	
Language	28,	German	3	
Language	40,	Spanish	3	
Those who took Language 55, 71, or 43 in the first semester Sophomore will take Language 56, 72, or 44.				
Domestic Economy (for women)	4,	Clothing	2	
Military 4, or Athletics (for men)				
Physical Culture (for women)	4,	Swedish Gymnastics		
		Total semester hours		18 to 20

Junior Year.

Either at the beginning of the Junior year or not later than the end of the first semester of that year candidates for the degree of Bachelor of Science in the General Science course must select a science which shall constitute a major line of study throughout the Jnior and Senior years. This work shall occupy not less than three hours per week during any one semester. The total number of hours of the major subject, however, shall not be less than sixteen hours during the two years. In addition to the work in the chosen line of study, or the major subject, the student may be required to choose at the proper time during the two years from five to ten hours of courses that are requisite to the proper development of this work. The line of study with the additional study requisite to it are to be decided upon after consultation with the Dean of Science and the Head of the Department in which the line of work is taken. The major science shall be chosen from among the following named sciences: Botany, Zoology, Physics, Economic Science, Mathematics, Geology and Chemistry. The remainder of the total sixty-four to eighty hours required shall be selected from among all the courses offered on consultation with the Dean of Science and the Heads of the Departments in which the work may be selected and is otherwise unrestricted. Not later than the beginning of the second semester of the Junior year these courses shall be made out on blanks furnished at the Dean's office and a copy left on file there. These outlins of study shall consist of the special line of study and the subjects requisite to it and enough other subjects to make ten to fifteen hours work. The remainder may be filled in at the beginning of each semester. The outline as placed on file cannot bechanged without the special permission of the faculty.

FIFTH SEMESTER.

(Elective)	Required semester hours
Enough work will be selected from the list of Science Division Electives given on page 265 to make a total of from sixteen to twenty hours per week.	16 to 20
Total	16 to 20

SIXTH SEMESTER.

		Required semester hours
Public Speaking 8,	Orations and Orators	1
Elective:		
Enough work will be selected from the list of Science Division Electives given on page 265 to make a total of from sixteen to twenty hours per week.		15 to 19
Total		16 to 20

Senior Year.

SEVENTH SEMESTER.

			Required semester hours
	(Required)		
Choice	Public Speaking 10, Public Speaking 9,	Extempore Speech 2 Oration 1	1 or 2
	Elective:		
	Enough work will be selected from the list of Science Division Electives given on page 265 to make a total of from sixteen to twenty hours per week.		16 to 18
	Total		16 to 20

EIGHTH SEMESTER.

	Required semester hours
Elective:	
From sixteen to twenty hours per week will be selected from the list of Science Division Electives given on page 265.	
Total	16 to 20

COURSE IN DOMESTIC ECONOMY.

(For Women Only.)

Academic Year.

Any student who at entrance presents satisfactory credit for part of the Academic Course, or who by examination passes part of it satisfactorily, will be classified in such of the remaining work offered in the Academic year as the Dean of the Junior College and the Dean of the Science Division shall consider will best prepare her for her college course. After providing in such classification for the remainder of the thirty credits required for entrance to college, the student may complete her schedule by taking up some of the Freshman studies.

A SEMESTER.

		Required semester hours
Mathematics 3,	Algebra	5
English 2,	Rhetoric and Composition	5
Modern Languages:		
The Language selected must be carried through the entire year.		
Choice: Language 1,	French 5	5
Language 5,	German 5	
Language 30,	Spanish 5	
Civics 8,	Government in State and Nation	3
	Total semester hours	18

B SEMESTER.

		Required semester hours
Mathematics 5,	Plane Geometry	5
Literature 9,	English Classics	5
Modern Languages:		
The Language selected must be a continuation of the one chosen at the beginning of the Academic year.		
Choice: Language 2,	French 5	5
Language 6,	German 5	
Language 31,	Spanish 5	
History 2,	Advanced American	4
	Total semester hours	19

Freshman Year.

FIRST SEMESTER.

		Required semester hours	
Domestic Economy 1,	Clothing	2	
Mathematics 4,	College Algebra	5	
Botany 29,	General Botany	5	
English 10,	Narration and Description	3	
Physical Culture 1,	Marching Tactics		
Elective:			
To be selected from the Junior College Electives on page 265		3 or	5
	Total hours required	18	20

SECOND SEMESTER.

		Required semester hours	
Domestic Economy 4,	Clothing	2	
Mathematics 6,	Solid Geometry	2	
Mathematics 30,	Plane Trigonometry	3	
Chemistry 22,	Elementary Chemistry	5	
English 11,	Exposition	3	
Physical Culture 2,	Calisthenics		
Elective:			
To be selected from the Junior College Electives on page 265		3 or	5
	Total hours required	18	20

Sophomore Year.

THIRD SEMESTER.

		Required semester hours	
Domestic Economy 6,	Costume	2	
Chemistry 24,	Elementary Applied Chemistry	5	
Physics 301,	Mechanics and Heat	3	
Zoology 2,	General Zoology	5	
Physical Culture 3,	Light Apparatus		
Elective:			
To be selected from the Junior College Electives on page 265		3 or	5
	Total hours required	18	20

**Freshmen who show deficient preparation in English or Mathematics may be assigned by the Dean of the Junior College and the Dean of Science, to special classes, with one credit hour more work than indicated above, or in case of clear indication of failure, even with this arrangement, they may be assigned to Academic classes.

FOURTH SEMESTER.

		Required semester hours
Domestic Economy 7,	Costume	2
Chemistry 9,	Organic Chemistry	5
Physics 402,	Electricity and Magnetism and Light and Sound	3
Zoology 3,	General Zoology	5
Physical Culture 4,	Swedish Gymnastics	
Elective:		
To be selected from the Junior College Electives on page 265		3 or 5
	Total hours required	18 20

Junior Year.

FIFTH SEMESTER.

		Required semester hours
Chemistry 11,	Quantitative Analysis	5
Zoology 12,	Human Physiology	5
Botany 38,	Bacteriology	2
Horticulture 11,	Floriculture	2
Enough work will be selected from the list of Science Division Electives on page 265 to make		2 or 6
	Total hours required	16 to 20

SIXTH SEMESTER.

		Required semester hours
Zoology 13,	Human Physiology	5
Domestic Economy 35,	Food and Dietetics	5
Domestic Economy 37,	Home Sanitation	2
Botany 35,	Fermentations	2
Enough work will be selected from the list of Science Division Electives on page 265 to make		2 or 6
	Total hours required	16 to 20

Senior Year.

SEVENTH SEMESTER.

		Required semester hours
Domestic Economy 8,	Laundry Work	1
Domestic Economy 27,	Household Accounts	1
Domestic Economy 36,	Food and Dietetics	5
Public Speaking 15,	D. E. Extempore Speech	2

Elective:			
Domestic Economy 9,	Theory of Teaching Domestic Science	2	7 to 11
Domestic Economy 11,	History of Art	2	
Domestic Economy 14,	Theory of Teaching Domestic Art	2	
For additional Electives, see page 265			
	Total hours required		16 to 20

EIGHTH SEMESTER.

		Required semester hours	
Domestic Economy 13,	Home Decoration	1	
Domestic Economy 22,	Home Nursing	1	
Domestic Economy 23,	Home Management	1	
Domestic Economy 38,	Geography of Foods	2	
Elective:			
Domestic Economy 10,	Theory and Practice of Teaching Domestic Science	2	11 to 15
Domestic Economy 12,	History of Art	2	
Domestic Economy 30,	Seminar	1	
Domestic Economy 32,	Theory and Practice of Teaching Domestic Art	2	
For additional Electives, see page 265			
	Total hours required		16 to 20

All regular classified Sophomore Domestic Economy or General and Domestic Science in year 1907-08 may classify Senior in Domestic Economy Course taking the following work:

Senior Year.

SEVENTH SEMESTER.

		Required semester hours
Chemistry 11,	Chemistry	5
Zoology 12,	Human Physiology	5
Domestic Economy 36,	Food and Dietetics	5
Public Speaking 15,	D. E. Extempore Speech	2
	Total hours required	17

EIGHTH SEMESTER.

		Required semester hours
Zoology 13,	Human Physiology	5
Domestic Economy 13,	Home Decoration	1

Domestic Economy 22,	Home Nursing	1
Domestic Economy 23,	Home Management	1
Domestic Economy 38,	Geography of Foods	2
Enough work will be selected from the list of Science Division Electives on page 265 to make		6 or 10
	Total hours required	16 to 20

SUMMARY SCIENCE DIVISION.

NOTE.—The number before the parenthesis indicates the course number. The number in the parenthesis indicates the number of hours credit.

GENERAL SCIENCE COURSE.

	Credit hours
English 10 (3), 11 (3), 12 (2)	8
History 5 (3)	3
Library 1	R
Mathematics 4 (5), 6 (2), 30 (3).	10
Military 1, 2, 3 or Athletics, 4 or Athletics (for men) Physical Culture 1, 2, 3, 4 (for women)	R
Modern Language (5), (3)	8
Public Speaking 8 (1), 9 (1)	2
Junior College Electives	
See list and rules under each semester of General Science Course. 1st semester (5), 2nd semester (5), 3rd semester (16), 4th semester (18)	44
Senior College Electives	
Major (16)	16
Selected from list of Science Electives	46
Grand Total	137

DOMESTIC ECONOMY COURSE.

	Credit hours
Botany 29 (5), 35 (2), 38 (2)	9
Chemistry 9 (5), 11 (5), 22 (5), 24 (5)	20
Domestic Economy 1 (2), 4 (2), 6 (2), 7 (2), 8 (1), 13 (1), 22 (1), 23 (1), 27 (1), 35 (5), 36 (5), 37 (2), 38 (2)	27
English 10 (3), 11 (3)	6
Horticulture 11 (2)	2
Mathematics 4 (5), 6 (2), 30 (3)	10
Physical Culture 1, 2, 3, 4	R

Physics 301 (3), 402 (3)	6
Public Speaking 15 (2)	2
Zoology 2 (5), 3 (5), 12 (5), 13 (5)	20
Junior College Electives (3), (3), (3), (3) See following list.	12
Senior College Electives (2), (2), (7), (11) See Course which allows Domestic Economy 9 (2), 10 (2), 11 (2), 12 (2), 14 (2), 30 (1), 32 (2), or any Senior College General Science elective.	22
Grand Total	136

DOMESTIC ECONOMY COURSE.

Junior College Electives.

Subjects which may be elected in the Freshman and Sophomore years in the Domestic Economy Course and which are called Junior College electives.

(The number in the parentheses indicates the number of hours credit.)

Botany 4 (5), 12 (4), 15 (3 or 5), 28 (5).
Civics 6 (2), 9 (3).
Civil Engineering 308 (4).
Economic Science 9 (3).
English 12 (2).
Languages 1 (5), 2 (5), 3 (5), 50 (3), 5 (5), 6 (5), 7 (5), 26 (3), 30 (5), 31 (5), 32 (5), 38 (3).
Literature 1 (3), 2 (5), 5 (5).
Mathematics 8 (5), 9 (5), 23 (3), 24 (2), 25 (3), 26 (4).
Psychology 1 (5).
Public Speaking 2 (1).
Zoology 5 (3 or 5), 7 (5), 14 (3), 17 (3).

ELECTIVES SCIENCE DIVISION.

Note—(The number in the parenthesis indicates the number of hours credit).

FIRST SEMESTER.

Subjects which count as Science.

Botany 4 (5), 5 (3 or 5), 6 (3), 10 (2), 13 (2), 14 (2), 17 (3), 18 (1), 19 (2), 22 (2), 27 (5), 30 (4), 34 (4), 37 (3), 60 (2).
Chemistry, 2 (5), 11 (5); 14 (5).
Domestic Economy, 8 (1), 36 (5).
Economic Science, 1 (5), 3 (3), 7 (2), 9 (3).

Geology, 501 (5), 704 (4).
Mathematics, 7 (2), 8 (5), 10 (2), 11 (5), 15 (2), 24 (2), 25 (3).
Psychology, 1 (5).
Physics, 509 (2), 514 (2), 516 (2), 523 (1).
Zoology, 2 (5), 4 (5), 5 (3 to 5), 10 (3 to 5), 11 (3 to 5), 12 (5), 18 (2).

General Subjects.

Civics, 2 (3), 6 (2), 9 (3), 11 (2).
Civil Engineering, 308 (4).
Domestic Economy, 1 (2), 6 (2), 11 (2).
English, 7 (1), 12 (2), 13 (2).
History, 3 (3), 6 (3), 10 (2), 12 (2), 20 (2).
Horticulture, 8 (3), 11 (2).
Language, 1 (5), 3 (5), 5 (5), 7 (5), 30 (5), 32 (5).
Literature, 1 (3), 4 (3), 5 (5), 6 (2), 8 (2).
Militry, 5 (1), 7 (1).
Psychology, 4 (3), 5 (3).
Public Speaking, 2 (1), 3 (2), 5 (2), 7 (2), 10 (2).
Veterinary, 33 (2).

SECOND SEMESTER.

Subjects which count as Science.

Botany, 11 (4), 12 (4), 15 (3 or 5), 18 (1), 20 (3), 28 (5), 35 (2), 36 (4)
Chemistry, 9 (5), 16 (2), 31 (4), 32 (4), 36 (5), 47 (5).
Domestic Economy, 22 (1), 23 (1), 35 (5), 37 (2), 38 (2).
Dairy, 10 (1).
Economic Science, 4 (2), 5 (3), 6 (2), 9 (3), 11 (2), 13 (1).
Geology, 2 (5), 6 (4), 9 (2), 607 (4), 805 (4).
Mathematics, 9 (5), 16 (4), 18 (1), 23 (3), 26 (4), 31 (3).
Physics, 615 (1), 617 (2).
Psychology, 3 (3).
Zoology, 3 (5), 6 (1), 7 (5), 8 (2), 10 (3 to 5), 13 (5), 14 (3), 17 (5).

General Subjects.

Civics, 3 (3), 4 (2), 10 (2), 12 (2).
Domestic Economy, 4 (2), 7 (2), 12 (2), 13 (1).
English, 8 (1), 12 (2).
History, 4 (3), 5 (3), 9 (2), 11 (2), 20 (2), 21 (2).
Language, 2 (5), 6 (5), 26 (3), 31 (5), 38 (3), 50 (3).
Literature, 2 (5), 3 (3), 7 (2), 10 (3), 11 (2).
Military, 6 (1), 8 (1).
Psychology, 2 (3), 4 (3), 6 (3).
Public Speaking, 2 (1), 3 (2), 4 (2), 6 (2), 8 (1), 10 (2), 11 (2).

DEPARTMENT OF MATHEMATICS.

EDGAR WILLIAMS STANTON, PROFESSOR.
MISS MARIA ROBERTS, ASSOCIATE PROFESSOR.
MR. PATTENGILL AND MISS COLPITTS, ASSISTANT PROFESSORS.
MISS FLEMING, MR. JONES, MISS SMITH AND MISS MOSHER, INSTRUCTORS.

The work of the Department of Mathematics is directed to the following ends:

(1) The Development of Intellectual Strength.—Such a degree of thoroughness is required as awakens interest and stimulates to earnest effort. The work is so arranged as to compel the student to abandon the mere mechanical methods of reaching results. He can make little or no progress except through the mastery of principles and methods; and in their application there is demanded of him a high degree of ingenuity, care, and courage. He is subjected to the continuous discipline of holding details in mind, comparing facts, drawing conclusions and advancing to the discovery of new truth. He learns to think, judge, originate, and through his mathematical training gains mental strength.

(2) Accuracy in Presentation of Mathematical Truths.—The student is required not only to think clearly, but to put his thought into concise and precise English. In the explanation of examples he is asked to bring out and emphasize the principles involved, dealing in detail with such equations only as are necessary to this purpose. In the solution of problems an analysis of statement and equation must be given, definitions and theorems must be stated clearly and accurately and in the demonstration of propositions the use of correct language is considered as secondary only to the employment of correct logic.

(3) The acquirement of such Command of the Subject Matter of Mathematics as will make it a Valuable Instrument in Higher Scientific and Technical Study.—To this end an effort is made to eradicate from the student's mind the idea entertained by many that mathematical truths are learned simply to be forgotten, and to awaken in its place an earnest desire to obtain a comprehensive and abiding knowledge of the essential facts of the science. Thoroughness in daily recitation is demanded, frequent reviews are given and final credits are made to depend largely upon the student's grasp of principles and the readiness and the accuracy with which he performs the simple and the complex operations involved in their application. Each branch as it is taken up is so presented as to require the constant employment of the principles and facts of the preceding mathematical studies. The Department aims in this way to give the student such a degree of mathematical maturity and self-reliant mastery as will enable him to use his mathematical knowledge with profit either in advanced collegiate work or as an instructor in our high schools and academies.

COURSES IN MATHEMATICS.

1. **Algebra to Involution.** Required for entrance to all Academic courses unless satisfactory credits are presented. Students taking up this work must have a thorough knowledge of addition, subtraction, multiplication, division, factoring, highest common factor, lowest common multiple, fractions, and simple equations containing one or more unknown quantities. Preparation in excess of this will be to the student's advantage. The review and advanced work of this course includes an exhaustive study of those subjects which in any standard text precede involution, the examples and problems being more difficult than those in the ordinary text book. Special stress is laid upon the statement of definitions and the demonstration of principles. Recitations, five hours per week.

2. **Algebra, Involution to Ratio and Proportion.** "A" semester Academic year in all courses of those students who have completed Course 1 at the College. Includes study of Involution of Monomials and Polynomials; Evolution, including the consideration of the higher roots of polynomials, and rules for determining the roots of numbers based upon the algebraic method of extracting roots; Radicals, including the fundamental operations, involution, evolution, rationalization, imaginary quantities, extracting the square root of binomial surds and the solution of equations involving radicals; Pure and Affected Quadratics; Equations solved like quadratics; and Simultaneous Quadratic Equations. Prerequisite, Course 1. At the completion of this course students are expected to have such grasp of algebra through quadratics as will enable them to handle its principles up to this point without error and perform the operations required with rapidity and accuracy. Recitations, five hours per week.

3. **Algebra Review.** "A" or "B" semester in all four year courses and first semester of the first year in two year courses in Ceramics and Mining Engineering. This course, which covers all fundamental principles up to and including radicals and quadratics, takes the place of the *review in arithmetic* given in most high schools and corresponds to the *review in algebra* given in an increasing number of the best high schools of the state.

The object aimed at is not only a thorough review of the elements of algebra, but a wider grasp of principles and their application in more difficult fields. Many examples assigned are such as enter into future work. The student is thus introduced to a quality of work demanding a broad view of principles and methods, and a marked degree of skill in algebraic manipulation.

The course is intended primarily for students who, having taken elementary algebra in the high school, need a thorough review before entering advanced work, but it may be taken by students who show evidence of a thorough knowledge of algebra through simple equations and at least a brief course through radicals.

Admission is secured by examination or upon the certificate of the proper officer of a high school.

Recitations, five hours per week.

4. College Algebra. First semester Science Courses. Includes study of ratio, proportion, variation, the progressions, permutations, binomial theorem, convergency and divergency of series, theorem of undetermined coefficients including partial fractions, principles and use of logarithms, and the theory of equations. Prerequisites, Courses 1 and 2 or Course 3. Also open to graduates of fully accredited high schools. The first ten days of the semester is devoted to a review of algebra up to and including quadratics. Students failing in this test will be assigned to such work as they are fitted to pursue.

Graduates of accredited schools are earnestly urged to carefully review their work in algebra before entering this course. The sample questions printed elsewhere in this catalogue give a good idea of the knowledge of the subject needed. The Department will gladly unite with the student and his school principal in arranging to test the thoroughness of his home review; such test can be given in connection with the work of the high school and if satisfactory to the Department, will be accepted in lieu of the review test at the College. The student can then begin his advanced work without delay. Students designing to take the review here must be present promptly at the opening of the semester. Correspondence regarding this whole matter is cordially invited.

Students not graduates of the fully accredited schools will be admitted to this course upon passing a satisfactory examination upon the work covered by Course 3. Arrangements can be made with the principals of high schools or county superintendents to conduct such examinations. The principal of any school desiring to test the ability of his students to enter upon the work of this course will be furnished, upon request, a list of examination questions. The Department will be pleased to mark the examination papers and enter upon its records as accredited students in the Mathematical Department the names of all students who show that they are prepared to take up the work with success. Recitations, five hours per week.

5. Plane Geometry. "B" semester in all four year courses, and first semester of first year in two year courses in Ceramics and Mining Engineering. Includes subjects generally treated in a standard text, including fundamental definitions and axioms, theorems relating to rectilinear figures and the circle, measurement of angles; doctrine of limits; theory of proportion; similar polygons; comparison and measurement of the surfaces of rectilinear figures; measurement of the circle, and geometrical construction of plane figures. The proofs outlined must be fully amplified; definitions must be stated with precision; authority cited must be given in full and the logical steps in demonstration must be so arranged and presented as to constitute a complete and rigid proof. The student must understand each proposition and be able to state the demonstration in concise geometric language. Special emphasis will be laid upon the demonstration of original exercises. Prerequisite, Course 1. Recitations, five hours per week.

6. **Solid and Spherical Geometry.** "B" semester Engineering Courses and second semester Science Courses. Looking forward to this work the students immediately before leaving home should carefully go over the whole subject of plane geometry. The subjects considered in the course are the properties of planes, of diedral and polyedral angles, of prisms, of pyramids and other polyedrons, of cylinders, cones and spheres, of spherical triangles and spherical polygons. Prerequisites, Courses 3 and 5. Two hours credit. Recitations, five hours per week the last six weeks of the semester, in Engineering Courses, first six weeks in all other courses.

7. **Spherical Trigonometry.** Elective Science Courses. The spherical right triangle is investigated; triangles of reference are formed and formulas deduced therefrom; Napier's rules are applied; the six different cases arising in the solution of right triangles are discussed and illustrated by numerous examples. Spherical triangles in general are considered; the formulas relating thereto are derived and applied to the solution of examples; interesting problems connected with the celestial sphere are included in the course. Prerequisite, Courses 21 and 22 or 30. Two hours credit. Recitation, four hours per week first half of the semester.

8. **Plane Analytic Geometry.** Elective Science and Agricultural Courses. The subject is taught largely from the standpoint of its value as a disciplinary study. Once the student is impressed with the spirit of its method, the beauty of its logic and the excellent field for analytical reasoning it opens up, he will readily find a way to a mastery of the particular facts it reveals. The student is introduced to the subject through a review of the special algebraic, trigonometric and geometric conceptions upon which it is based. These are applied to the analytic representation of points in a plane and the proposition established that all geometric lines and curves can be represented by equations, and their properties and relations discovered by a study of these equations. The line, the circle and the conic sections are in this way most carefully investigated. Examples involving principles are solved and from a knowledge of particular the student is led to the demonstration of general theorems. The generalized truth is then employed in the development of other truth, and thus the student is given a most excellent drill in both inductive and deductive reasoning. At the same time his needs, as a scientific student, of a knowledge of the facts of analytic geometry are fully met. Text book, Analytic Geometry by Tanner and Allen of Cornell University. Prerequisites, Courses 4 and 30. Recitations, five hours per week.

9. **Differential and Integral Calculus.** Elective Science and Agricultural Courses. All preceding mathematical work should be completed before this course is undertaken. Calculus bears to that work the double

relation that, while it is based upon it and cannot be pursued successfully except as the work has been well mastered, it on the other hand furnishes a most excellent opportunity for a general review of the preceding mathematical studies and gives to all that has gone before a significance and value which it would otherwise lack. It is therefore a most important part of any extended and thorough mathematical course. The abstruse principles of this higher method of mathematical investigation are explained upon the theory of limits. The theory of infinitesimals is also employed. In differential calculus the rules of differentiations, expansion of functions, indeterminate forms, tangents, normals and asymptotes, direction of curvature, points of inflection, radius of curvature, order of contact, the osculating circle, envelopes, singular points and maxima and minima of functions are studied. In integral calculus much time is spent in acquiring a usable knowledge of the forms of integration. Application of integration is then made to the determination of the lengths of plane curves, areas of plane surfaces and surfaces of revolution, volumes of solids of revolution and other solids. Recitations, five hours per week, with a review of week's work each Friday.

10. Differential Equations. Fifth semester Electrical Engineering Courses, elective Science Courses. Supplementary to integral calculus, including the formation of differential equations; solution of equations of the first order with applications to geometry, mechanics and physics. Prerequisite, Course 9 or 26. Two hours credit. Recitations, five hours per week for the last seven weeks.

11. Advanced Differential Equations. Elective Science Courses. Includes all subjects of Course 10 and in addition the study of the methods of handling linear equations with constant and variable coefficients; exact differential equations; integration in series; equations of the second order with geometrical, mechanical and physical applications; ordinary differential equations with more than two variables; partial differential equations of the different orders. Prerequisite, Course 9 or 26. Recitations, five hours per week.

15. Advanced Analytic Geometry. Elective Science Courses. A study of the general equation of the second degree, higher plane curves and analytic geometry of three dimensions. Prerequisites, Courses 8 and 9. Two hours credit. Recitations, four hours per week during last half of the semester.

16. Advanced Calculus. Elective Science Courses. Deals with the application of differential calculus to the discussion of the properties of curves; the application of both differential and integral calculus to functions of a complex variable; and the subject of definite integrals and the use of double integration in measuring surfaces. The principles involved are illustrated by numerous examples. Prerequisites, Courses 8 and 9. Recitations, four hours per week.

17. Algebra and Trigonometry. First semester all Agricultural Courses except Agricultural Engineering.

The main object of this course is to so ground the student in the principles of trigonometry as to enable him to carry successfully his work in surveying, drainage and allied subjects. The course is intended to give the student sufficient knowledge of the subject to enable him to elect analytic geometry and calculus which are fundamental to certain lines of work in the agronomy course. The subjects investigated are definitions; positive and negative angles; circular measures of angles; operations upon angles; functions of angles, their relations and varying values; determination of values of the functions of particular angles; functions of different angles expressed in terms of those of a basal angle; derivation and reduction of trigonometric formulas; solution of right and oblique triangles. The points most strongly emphasized are: Care in tracing the trigonometric functions of varying angles in the different quadrants, readiness and skill in the derivation and reduction of trigonometric formulas and accuracy in the use of logarithmic tables. Prerequisites, Courses 3 and 5. Three hours credit.

18. **Mathematical Analysis.** Elective Science Courses. Consists of lectures on the principles involved in the previous Mathematical courses. Its main purpose is to emphasize those principles which are most important and to suggest methods of presenting them effectively in the class room, thus helping those who expect to teach in mathematical lines. Prerequisites, all previous courses. One lecture per week.

20. **College Algebra.** First semester Engineering Courses and Ceramics and Agricultural Engineering. Includes study of ratio, proportion, variation, permutations, the progressions, binomial theorem, convergency and divergency of series, theory of undetermined coefficients including partial fractions, principles and use of logarithms, and theory of equations. Prerequisites, same as for Course 4. Recitations, five hours per week during first twelve weeks of the semester.

21. **Plane Trigonometry.** First semester Engineering Courses, Ceramics and Agricultural Engineering. Includes study of definitions; positive and negative angles; circular measure of angles, functions of angles, their relation and varying values; determination of functions of different angles expressed in terms of those of a basal angle; solution of trigonometric equations and the proving of identities. Prerequisite, Courses 3, 5, 6, and 20. Recitations, five hours per week during last four weeks of the semester.

22. **Plane Trigonometry.** Second semester Engineering Courses, Ceramics and Agricultural Engineering. Includes those subjects of the usual courses in trigonometry not included in Course 21; namely, the derivation of the formulae relating to the sum and difference of two angles, functions of double angles and of half angles with identities and equations based upon these formulae and the solution of right and oblique triangles. Prerequisites, Courses 20 and 21. Recitations, five hours per week during first seven weeks of the semester.

23. Plane Analytic Geometry. Second semester Engineering Courses, Ceramics and Agricultural Engineering, elective in all courses in Science and in Agriculture. The work covered is the first eight chapters in Tanner and Allen's Analytic Geometry. Prerequisites, Courses 20, 21, and 22. Three hours credit. Recitations, five hours per week during last twelve weeks of the semester.

24. Plane Analytic Geometry. Third semester Engineering Courses, Ceramics and Agricultural Engineering, elective Science Courses and Agricultural Courses. The work covered is chapters IX, X, XI in Tanner and Allen's Analytic Geometry. This course, together with Course 23 which preceds it, covers the same ground as Course 8. Prerequisite, Course 23. Two hours credit. Recitations, five hours per week during first four weeks of semester.

25. Calculus. Fourth semester Engineering Courses, Ceramics, and Agricultural Engineering, elective Science Course and Agricultural Courses. The work covers the rules of differentiation, together with numerous examples illustrating their use and a large number of problems showing the close relation of differential calculus to physics and mechanics, also its application to the expansion of functions and to indeterminate forms. In Integral Calculus, the rules of integration are derived and enforced by a sufficient number of examples to make this most efficient tool of the engineer thoroughly ready for his later use. Prerequisites, Courses 20, 21, 22, 23, 24. Three hours credit. Recitations, five hours per week last twelve weeks of semester.

26. Calculus. Fourth semester Engineering Courses, Ceramics, and Agricultural Engineering, elective Science and Agricultural Courses. The work covered in differential calculus includes tangents, normals, asymptotes, direction of curvature, points of inflection, radius of curvature, order of contact, osculating circle, envelopes, singular points, and maxima and minima; in integral calculus, applications are made to obtaining lengths of plane curves, areas of plane surfaces, and surfaces of revolution, volumes of solids of revolution and other solids. Prerequisite, Course 25. Recitations, four hours per week.

27. Spherical Trigonometry. Fifth semester Civil Engineering Course. Covers same ground as Course 7. One and a half hours credit. Recitations, four times a week for seven weeks.

30. Plane Trigonometry. Second semester Science Courses and second semester Two Year Courses in Ceramics and Mining Engineering. The subjects covered are the same as those included in Course 17, with the exception that since the students taking this course have had considerable previous work in logarithms, more time is devoted to identities and the solution of trigonometric equations. Prerequisites, Courses 3, 4, 5 and 6. Three hours credit.

31. Theory of Equations. Elective Science Courses. Includes the study of Determinants, Series, and Theory of Equations. Prerequisites, Courses 4 and 30. Recitations, three hours per week.

DEPARTMENT OF GENERAL AND APPLIED CHEMISTRY.

ALFRED A. BENNETT, PROFESSOR.
LOLA A. PLACEWAY, ASSOCIATE PROFESSOR.
W. F. COOVER, ASSOCIATE PROFESSOR.
LOLA STEPHENS, LAURA TAGGART, AND MELISSA FLYNN, INSTRUCTORS.
LILLIAN LISTER, R. W. GETCHELL, AND F. G. CHURCHILL, LABORATORY ASSISTANTS.
JESSE MCKEEN, STUDENT ASSISTANT.

The aim of the instruction in Chemistry is to develop in the student the inductive and experimental method of study, to excite in him an appreciation and love for true experimentation and to train his powers for inductive thinking, thus laying a foundation for technical or applied Chemistry.

The method of study is, therefore, distinctively the laboratory method. On the average, the student employs two hours of time in laboratory study for every hour of recitation. This proportion of time for the two divisions of work is especially carried out in the earlier part of the class study. The class room work aids to fix in the mind of the student chemical principles and facts based upon what has been learned by the actual handling and study of chemical substances.

Equipment and Accommodations.

The Chemical department occupies the whole of the four floors of the building known as Chemical Hall. The building is "T" shaped with a front of 70 feet by 40 feet and a wing of 60 feet by 32 feet and contains twenty-seven rooms, ten of which are laboratories, the remainder being lecture, office, balance and store rooms.

The laboratories contain working tables which by a system of lockers can accommodate six hundred students. The assaying laboratory is well supplied with tables, furnaces and other apparatus for fire assaying. The laboratory for the course in blow piping is fitted with air blast and all of the usual conveniences for such laboratories.

The department is well supplied with accurate weights and balances for the courses involving quantitative analysis.

Persons desiring to prepare themselves to become teachers of chemistry, analytical chemists, or those seeking a preparation for the study of medicine will find here good facilities for study. The expenses are only sufficient to cover the actual cost of the material used in the prosecution of the work.

Description of Courses in Chemistry.

The work in Chemistry is conveniently grouped under the following general heads: (a) General and Descriptive Chemistry; (b) Analytical Chemistry, Qualitative and Quantitative Analysis; (c) Organic Chemistry; (d) Studies in Applied Chemistry.

(a) **General and Descriptive Chemistry** includes an elementary study of the non-metallic and metallic elements, their history, occurrence, preparation, properties and their principal compounds. In order better to train his powers of observation the student is required to describe the apparatus used and the phenomena produced, and to trace the relation of the results obtained to laws and principles.

The different courses in General and Descriptive Chemistry are arranged to meet, as far as practicable, the special needs of the students of the various departments. However, it is recognized that at this stage of the work the **Science of Chemistry** is the student's most practical acquisition.

(b) **Analytical Chemistry,** both **Qualitative** and **Quantitative,** is taken up in an elementary way at first and may be followed by courses in more advanced work. After this preliminary knowledge is obtained, the direction of the work will depend to a great extent on the degree the student is aiming to obtain. For the degree in **Agriculture** the analytical study is directed to an examination of those substances of agricultural interest, and to prepare the student for an intelligent use of the scientific data upon which agriculture is founded. In any case the purpose is to study Applied Chemistry from the standpoint of its fundamental principles.

In the recitations, methods of analysis are described and discussed, and the study of the theoretical chemistry carried forward. In this work, courses of study are arranged for graduate as well as for undergraduate students.

(c) In **Organic Chemistry,** courses are offered for the first degree and also as major and minor subjects for graduate students.

The course required of the students in the Division of Veterinary Science is of an elementary nature and is intended to give a sufficient knowledge of the subject to lay the foundation for the study of Physiological Chemistry which follows. The latter course considers the chemical changes going on in the living animal body; the essential composition of foods and the changes through which they pass in the animal economy; the chemistry of the secretion and excretion. The laboratory study is devoted to the three principal food constituents and to urine analysis.

The undergraduate in the Division of Agriculture under the topic Organic Chemistry, studies in addition to the general principles of the subject, the chief food substances, i. e., the carbo-hydrates, fats, and proteids, poisonous substances found in the organic world, such as the alkaloids, ptomaines; the chemistry of milk and of the manufacture of butter and cheese. In a word, the student will consider, as completely as the time allotted to the subject will allow, the important questions that concern agriculture from the chemical standpoint.

To undergraduate students in the Division of Science is given a fairly complete outline of the theory of the structure and formation of organic compounds, but special attention is given to those compounds that are of commercial importance. In the laboratory the student prepares many of the more important manufactured organic substances, such as alcohol and soaps, and makes a special study of vinegars, sugar, petroleum and its products, glycerine, etc.

With this work as a foundation the graduate student selects some feature or features for more complete study. The amount and character of the work is left for arrangement between the individual and the head of the department. However, this will embrace such work as the analysis and study of foods, oils, fats, and the methods of preparation, purification, and adulteration of commercial organic substances.

(d) **Applied Chemistry.** It is recognized among persons whose opinions are worthy of consideration that the application of any science to the problems of life can be profitably taken up by the student only after a thorough grounding in the principles upon which the science rests. The purpose of the preliminary courses in this subject is to give this training as completely as possible.

Some twenty-five courses of study in applied chemistry are offered, or are required of the students for the various degrees open to them. In the nature of the case, this work is essentially quantitative analysis and consists of courses in the analysis of Agricultural products; Fuel and Gas Analysis; Blowpipe Analysis; Assaying; Chemistry of the Household; The Preparation of Organic and Inorganic Compounds.

The courses in Agricultural Analysis include both inorganic and organic substances such as: Soils, fertilizers, water, fodders, and dairy products. This work is open to undergraduate and graduate students, i. e., the latter class of students will carry forward the work begun in the usual college courses.

The course in Fuel and Gas Analysis consists of the study of solid, liquid, and gaseous fuels, in reference to their composition, and to their relative economic values. The student may devote the time of this course, principally, to technical analysis. The principles and methods of quantitative analysis learned in the elementary courses will be applied in the advanced work to the analysis of various organic and inorganic substances, such as foods, iron, and steel. The application of the facts of Electrochemistry to the quantitative analysis of ores, and in the manufacture of chemicals will be studied in an elementary manner. Although the work is largely done in the laboratory, it will be supplemented by lectures and recitations.

Quantitative Analysis by "fire methods," or, as it is commonly called, Assaying, is applied to gold, silver, copper, and lead ores.

The courses in chemical preparations will include the formation of pure and commercial articles from raw materials, and the common adulteration of these products.

Chemistry of the Household considers the elementary chemistry of the principal food materials, changes produced in them during cooking and digestion, of cleaning and of adulteration of the chief food substances.

This course may be accompanied by a laboratory study of soaps, soap preparations, sugars, syrups, vinegars, and baking powders.

The work in Physiological Chemistry for the student in the Science Division (Course 36) includes a careful study in the laboratory, of the composition of foods, the chemical characteristics of their constituents, the changes during digestion and assimilation, and the products of metabolism. The classroom work correlates these facts and by lectures and text-book they are given their appropriate explanation.

The work in Water Analysis covers a study of the methods employed, namely, the so-called mineral and sanitary analysis, and the interpretation of these results, especially from the standpoint of the household, and for use in boilers in the production of steam. Methods of purification of water and a study of sewage will receive attention.

In each course in Chemistry, except Course 10, a deposit of $5.00 is charged to cover cost of materials used and breakage.

COURSES IN CHEMISTRY.

1. **Elementary Inorganic Chemistry.** First semester Veterinary Course. Three hours credit. Recitations, two hours, and laboratory, three hours, per week. Fee, $5.00.

2. **General Chemistry.** Third semester Five Year Engineering Courses, elective General Science Course. Five hours credit. Recitations, three hours, and laboratory, six hours, per week. Fee, $5.00.

4. **General Chemistry (Metals).** Second semester Veterinary Course. Three hours credit. Recitations, two hours, and laboratory, six hours, per week. Fee, $5.00.

5. **Qualitative Analysis.** Fourth semester Five Year Engineering Courses, elective General Science Course. Continuation of Course 2. Five hours credit. Recitations, three hours, and laboratory, six hours, per week. Fee, $5.00.

9. **Organic Chemistry.** Fourth semester Domestic Economy, elective General Science Course. Prerequisites, Courses 2 and 5, or 22 and 24. Five hours credit. Recitations, four hours, and laboratory, three hours, per week. Fee, $5.00.

10. **Elementary Organic Chemistry.** Third semester Veterinary Course. Lectures, two hours per week.

11. **Quantitative Analysis.** Fifth semester Domestic Economy, elective General Science Course. Prerequisites, Courses 2 and 5, or 22 and 24. Five hours credit. Recitations, two hours, and laboratory, nine hours, per week. Fee, $5.00.

13. **Physiological Chemistry.** Fourth semester Veterinary Course. Recitations, two hours, and laboratory, one period, per week. Fee, $5.00.

14. **Organic Chemistry.** Elective Science Courses. Continuation of Course 9, subject to arrangement by head of department and pupil. Five hours credit. A major or minor graduate study. Fee, $5.00.

16. **Chemistry of the Household.** Elective Science Courses. Prerequisites, Courses 2, 5, and 9, or 22, 24, and 9. Credit, two hours. One lecture and one laboratory per week. Fee, $5.00.

22. **Elementary Chemistry.** Second semester Domestic Economy Course. Five hours credit. Recitations, three hours, and laboratory, two periods, per week. Fee, $5.00.

24. **Elementary Applied Chemistry.** Third semester Domestic Economy Course. Five hours credit. Recitations, three hours, and laboratory, two periods, per week. Fee, $5.00.

31. **Inorganic Preparations.** Elective Science Courses. Prerequisites, Courses 2, 5, and 9, or 22, 24, and 9. Four hours credit. Recitations, two hours, and laboratory, two periods per week. Fee, $5.00.

32. **Quantitative Analysis.** Elective Science Courses. Continuation of Course 11. Four hours credit. Fee, $5.00.

36. **Physiological Chemistry.** Elective Science Courses. Prerequisites, Courses 2, 5, and 9, or 22; 24, and 9. Five hours credit. Recitations, three hours, and laboratory, two periods, per week. Fee, $5.00.

39. **Water and Sewage Analysis.** Elective Civil Engineering Course. Recitation, one hour, and laboratory, two periods, per week. Fee, $5.00.

41. **General Chemistry.** First semester Engineering Courses. Recitations, two hours, and laboratory, one period, per week. Fee, $5.00.

42. **General Chemistry.** Second semester Engineering Courses, except Civil Engineering. Continuation of Course 41. Recitations two hours, and laboratory, one period per week. Fee, $5.00.

43. **Qualitative Analysis.** Third semester Mechanical, Mining, and Electrical Engineering, and Ceramics Courses. Continuation of Course 42. Three hours credit. Recitations, one hour, and laboratory, two hours, per week. Fee, $5.00.

45. **Analytical Chemistry.** Fourth semester Mechanical and Electrical Engineering Courses. Two hours credit. Fee, $5.00.

46. **Elementary Quantitative Analysis.** Fourth semester Mining Engineering Course. Four hours credit. Fee, $5.00.

47. **The Chemistry of Foods and Food Adulteration.** Elective Science Courses. Prerequisites, Courses 2 and 5, or 22 and 24, and 9 and 11. Five hours credit. Three recitations or lectures and two laboratory periods. Fee, $5.00.

48. **Assaying.** Fifth semester Mining Engineering Course. Prerequisites 41, 42, and 43. Four hours credit. Recitations and laboratory study. Fee, $5.00.

49. **Study of Metals.** Second semester Civil Engineering Course. Four hours credit. Fee, $5.00.

50. Quantitative Analysis. Fifth semester Two Year Course in Mining Engineering. Five hours credit. Fee, $5.00.

Graduate Work in Chemistry.

Graduate students will be provided with work in Organic and Inorganic Chemistry extending through two years if desired.

This subject is open as a major study to graduates of this and other colleges of equal standing who have pursued the study of chemistry for two years and who are by this prepared to carry on independent work in the various directions that may be arranged by them and the head of the department. The courses of study will be along the lines of Applied or Industrial Chemistry with a sufficient ground work of theoretical study to give a rational explanation and conception of the processes involved. The work will include advanced analytical and synthetical chemistry, i. e., a study of the methods of chemical analysis and the preparation of organic and inorganic componunds of industrial and commercial importance. The graduate student will select work along some one of these general lines of study and will devote his time to this, supporting it by other necessary collateral study, and such research in the literature of the subject as the library facilities will permit. A good reading knowledge of the German language will be essential to good progress in the prosecution of the work. Minor subjects in this department will be arranged so as to help as much as is possible the major subjects selected in the other departments.

Major or minor work may be taken in any of the following courses:

15. **Analysis of Foods.** Prerequisites, Courses 2, 5, 9, and 11.
17. **Fuel and Gas Analysis.** Prerequisites, Courses 2, 5, 9, and 11.
18. **Electro-Chemistry.** Prerequisites, Courses 2, 5, and 11.
19. **Water Analysis.** Prerequisites, Course 11.
33. **Qualitative Analysis.**
35. **Organic Preparations.** Prerequisite, Course 9.

AGRICULTURAL CHEMISTRY.

A. A. BENNETT, PROFESSOR.
W. F. COOVER, ASSOCIATE PROFESSOR.

The aim of the work in Agricultural Chemistry is twofold; namely, to give the student a fundamental knowledge of chemistry, and then to apply this knowledge to the chemical problems of agriculture.

Throughout the courses in Agricultural Chemistry, the study of chemical principles and relations is accompanied by its application to agricultural questions.

Courses in Agricultural Chemistry.

21. Elementary Experimental Chemistry. First semester Science and Agricultural and third semester all other Agricultural Courses and first semester Two Year Courses in Ceramics and Mining Engineering. Introductory work intended to give knowledge of matter by actual handling and experience with it. Includes study of so-called non-metallic elements present in air and soil. The recitations review the work of the laboratory, the student learning how to take useful notes, their interpretation and application to common chemical changes occurring in nature. Five hours credit. Recitations, three hours, and laboratory, two periods, per week. Fee, $5.00.

23. **Elementary Experimental Chemistry.** Second semester Science and Agriculture, and fourth semester all other Agricultural Courses, and second semester Two Year Courses in Ceramics and Mining Engineering. Continuation of Course 21. A study of the metallic or basic elements, their relation to non-metallic elements or the acids, and their place in formation of salts; the separation and recognition of these elements and their compounds preparatory to determining them quantitatively. Five hours credit. Recitations, three hours and laboratory, two periods, per week. Fee, $5.00.

25. **Agricultural Analysis.** Third semester Science and Agriculture and fifth semester all other Agricultural Courses, except Agricultural Engineering. A study of the fundamental principles of organic chemistry; the proximate composition of the various grains, root and fodder crops; the composition and changes occurring in farmyard and other manures; and the chemistry of assimilation and digestion. The laboratory work includes the preparation and study of a limited number of organic compounds, and study of carbohydrates, fats and proteids. Prerequisite, Course 23. Four hours credit. Recitations, three hours, and laboratory, one period, per week. Fee, $5.00.

26. **Agricultural Analysis.** Fourth semester Science and Agriculture, and sixth semester Dairying and Animal Husbandry, and elective all other Agricultural Courses. Includes preliminary work involving the principles of gravimetric and volumetric analysis, followed by analysis of fertilizers, grain and mill feeds and fodders. Prerequisite, Course 25. Four hours credit. Recitations, two hours, and laboratory, two periods, per week. Fee, $5.00.

27. **Agricultural Analysis.** Elective Agricultural Courses. Continuation of Course 26. Includes analysis of feeds, dairy products, vegetables, fruits, fresh foods, alcoholic beverages, vinegars, and other materials, frequently analyzed, such as limestones and waters for boiler supply. Outline for work, Sherman's "Notes on Organic Analysis" supplemented by lectures. Four hours credit. Recitations, two hours, and laboratory, two periods per week. Fee, $5.00.

28. **Dairy Chemistry.** First semester of One Year Course in Dairying. An elementary course arranged to fit the needs of the students in this course. Two lectures with accompanying experimental study. Two hours credit. Fee, $3.00.

29. Dairy Chemistry. Second semester, One Year Dairy Course. Two lectures with accompanying experimental study. Two hours credit. Fee, $3.00.

34. Advanced Agricultural Analysis. Elective Agricultural Courses. For those who wish to specialize in agricultural analysis. Involves the use of polariscope on sugar and saccharine products, of bulyro-refractometer in analysis of fats and oils, or calorimeter in the determination of fuel value of food-stuffs and fuels. Laboratory work may be along some special line or along any of the following subjects: the analysis of sugar and saccharine products, oils, fats and waxes, soaps and lubricants, paints and varnishes, tea, coffee and cocoa, canned fruits and vegetables, relishes, extracts and spices. Text-book, Sherman's "Notes on Organic Analysis," supplemented by notes. Prerequisite, Course 27 or 40. Four hours credit. Recitation, one hour, and laboratory, three periods per week. Fee, $5.00.

40. Dairy Chemistry. Seventh semester Dairy Course and elective Agricultural Courses. Analysis of pure dairy products; also a qualitative and quantitative analysis of adulterated products; the detection of the preservatives and coloring matters commonly used. Reference book, Richmond's "Dairy Chemistry." Prerequisite, Course 26. Four hours credit. Recitations, two hours, and laboratory, two periods per week. Fee, $5.00.

Graduate Work in Agricultural Chemistry.

Advanced work in Agricultural Chemistry leading to the Master's degree in Scientific Agriculture may be selected either as a major or minor study. This work may be taken in the Chemical department as a continuation of the work begun as an undergraduate of this or any other college of equal rank, or the student may elect to do this work with the chemical section of the Experiment Station, thus coming in touch with the research work and investigations being carried on there.

Graduate work may be taken in any of the following lines:

(a) **Chemistry of Soils.** Includes a study of Soil Chemistry and its relation to plant life, including the chemical composition, relation to fertility, determination of available plant food, fertilizers and other substances effective in production of crops, rain and drainage waters, and loss of plant food due to improper drainage and other conditions.

(b) **Chemistry of Dairying.** Covers a general survey of field of chemistry, applied to dairy problems, as the composition and chemical changes of butter, milk and cheese, and other fats and oils used as foods or as adulterants.

(c) **Chemistry of Feeds.** Includes study of the chemistry of plants and field crops, as chemical composition of corn, wheat and oats, methods of modifying and improving the chemical composition by selection and plant breeding, chemical study of growing plants during the various stages of development, effects of various elements in the soil on the composition, quality, yield or development of grain and forage crops, also study of the chemical composition and nutriments of the various refuse and by-products used for stock feeding.

(d) **Chemistry of Horticulture.** Includes study of chemical composition of fruits, including the influence of various elements in soil on the composition, quality, and productiveness of the orchard, vineyard, or garden, also influence of climatic conditions, selection and breeding upon the composition and quality of fruits.

DEPARTMENT OF BOTANY AND GENERAL BACTERIOLOGY.

LOUIS HERMANN PAMMEL, PROFESSOR.
ROBERT EARLE BUCHANAN, ASSOCIATE PROFESSOR OF GENERAL BACTERIOLOGY.
ESTELLE D. FOGEL, INSTRUCTOR IN BOTANY.
HARRIETTE KELLOGG, CURATOR OF THE HERBARIUM.
ADA HAYDEN, ROYAL E. JEFFS, AND A. L. BAKKE, LABORATORY ASSISTANTS.
CHARLES MURRAY, STUDENT ASSISTANT.

The Department of Botany and General Bacteriology occupies the major portion of the third and several rooms on the fourth floor of the new Central Building. Twenty-five well lighted and equipped rooms are devoted to the work of this department.

The Laboratory for Elementary Students, accommodating thirty students each period, is well equipped with individual laboratory tables, lockers, dissection microscopes, water, gas, reagents, etc.

Laboratory for Histology and Pathological Botany, accommodating thirty students each period, is equipped with separate laboratory tables, individual compound microscopes, lockers, wall cases, water and gas, and an abundance of fresh and preserved material for study.

The Laboratory in Cytology, accommodating eight students, is equipped with heavy laboratory tables supplied with water, gas, Leitz triple objective microscopes, paraffine baths, microtomes, stains, reagents, and abundant facilities for all kinds of cytological investigations.

The Laboratory for Physiological Botany is equipped with the necessary apparatus for a systematic study of the functions and activities of plants and their parts. Will accommodate eight students.

Laboratory for Special Botanical Drawing is primarily intended for students writing theses in this department and for post-graduates.

The Laboratory for Economic Botany is equipped with dissecting and compound microscopes and with an excellent economic herbarium.

The General Bacteriological Laboratory, accommodating twenty students, the Bacteriological Laboratory for advanced students, accommodating eighteen stuednts, and the Research Room in Bacteriology are each well equipped with large glass topped tables for each student, fitted up with gas, tap and distilled water, lockers for culture media and various apparatus, wall lockers for incubation of cultures at room temperature thermostats, ice chests, a culture room, balances, hood, and compound Leitz microscopes especially designed for bacteriological work.

The Media Room is fitted with stone topped tables, water, gas, etc., for the preparation of the various media used in the laboratory. A long hood covers the sterilizers and autoclaves needed for the preparation of these media.

For the use of all students in Bacteriology there is a small room for keeping cavies, etc., for experimentation, and also special facilities in the plant laboratories for experimental inoculation of plants.

A well lighted room on the fourth floor, used as pathological and physiological greenhouse laboratory, supplies an abundance of fresh material for class and laboratory work.

The lecture room is equipped with a very complete outfit for lantern demonstrations, both slides and lantern views.

HERBARIUM. The department now has about ninety thousand mounted and catalogued specimens in the herbarium. These consist of 44,000 in the General Phanerogamic Collection, 25,000 in the Parry Collection, 5,000 in the General Cryptogamic Collection, 15,000 in the Cryptogamic Exsiccati, and 1,200 in the Seed Collection. These specimens were collected in the Mississippi Valley, in Iowa in particular, also in the Eastern States, the Rocky Mountains, the Pacific coast and in Europe. The collection of Phanerogams was commenced under Dr. Bessey and continued under Dr. Halsted. Beside this there is the Parry Collection, Cryptogamic Herbarium, the Holway Herbarium (excepting the Uredineae), the Fink Herbarium (excepting the Lichens), and the Andrews Collection.

Grass Collection. This collection contains excellent material from every part of the state and various parts of the United States and Europe. It is invaluable to the student in Agrostology.

Parry Collection. This collection contains hundreds of new species found by Dr. Parry on his collecting trips and is especially rich in the plants of California, Mexico, and the Rocky Mountain Region. Most of these were collected before the advent of the railroad, many are types and hence invaluable.

Dendrological Collection. The herbarium also contains a very excellent collection for dendrological study, many of the trees being represented by photographs and wood specimens. The cases in which the herbarium is placed are made of about fifty species of wood native to the United States.

Economic Collection. This collection consists of very complete sets of the various plants of economic importance, either as the friends or foes of man, including a collection of weeds and poisonous plants.

Seed Collection. This contains the sets of seeds distributed by the U. S. Department of Agriculture, several sets of German weed seeds, and a large collection of the seeds of various cultivated and wild plants. This collection is of the greatest value in the study of seed adulteration.

Cryptogamic Collection. This collection contains a large number of very valuable exsiccati, the Ravenel Fungi Americana, Ellis North American Fungi, the von Thuemen Mycotheca Universalis, those of Sydow, Krueger, Seymour, and Earle, and numerous smaller collections.

THE MUSEUM. The department has a large amount of material incorporated into an Economic Museum. The collections are systematically grouped, showing in many cases the evolution of the finished product from the crude material, especially of the fiber products. There is also a collection of the various edible and poisonous fungi in formalin.

The work of this department is divided into the courses in Botany and those in General Bacteriology, in each of which undergraduate and graduate courses are offered. For graduate work, the department offers unusual facilities, major or minor work being offered to supplement that of the various scientific courses.

COURSES IN BOTANY.

1. **Elementary Botany.** "A" semester Agricultural Courses. Embraces a study of the terms used in descriptive botany, and of morphology and determination of flowering plants. Laboratory includes the chief points of elementary botany, such as the germination of seed, the different members of the plant, the root, shoot, and lateral appendages, the leaves, flower, fruit, and seed. A collection of fifty named plants is required. Required of all students in these courses who have not had a high school laboratory course equivalent to three hours per week for twenty weeks. Two hours credit. One lecture and laboratory three hours per week. Fee, $1.50.

4. **Cryptogamic Botany.** Elective Science and Agricultural Courses. A study of typical representatives of important groups below the flowering plants, especially smuts, rusts, mildews, and moulds, because of their signficance in Agriculture. Frequent excursions are obligatory. A collection of seventy-five mounted and classified specimens is required. Prerequisite, Course 27. Five hours credit. Lectures, three hours, and laboratory, six hours, per week. Fee, $3.00.

5. **Vegetable Pathology.** Seventh semester Senior year in Agronomy, Horticulture and Science and Agriculture, elective Agricultural and Science Courses. Study of the plant diseases of the various horticultural, garden, and farm crops from the standpoint of the host plant; also theories of prevention of disease, of rotation of crops, and the use of fungicides. Prerequisite, Course 4. Three or five hours credit. Lectures, two hours, and laboratory, three or nine hours, per week. Fee, $3.00.

6. **Advanced Non-vascular Cryptogams.** Elective Science and Agricultural Courses. Lectures and laboratory work on the various non-vascular cryptogams, particularly the fungi of our native flora; also laboratory investigation of a single group from both pathological and systematic point of view. Prerequisite, Course 4. Three hours credit. Lecture, one hour, and laboratory, six hours, per week. Fee, $3.00.

9. **Structural Botany.** First semester Veterinary Course. This course is designed for Veterinary students, it being necessary that the well equipped Veterinarian have a knowledge of the terms used in morphological botany, and of the microscopic structure of plants. Vegetable drugs may consist of the whole plant but more frequently of parts only, and hence the detection of adulterants is a subject for microscopic determination. Thus this course includes a study of parts of the plant from the root to the reproductive organs; with laboratory study of the histology of plants, especially from the standpoint of pharmacognosy, with a brief survey of more important groups from a systematic standpoint. Three hours credit. Lectures, two hours, and laboratory, three hours, per week. Fee, $3.00.

10. **Economic Botany.** Elective Agricultural and Science Courses. A microscopic study of various plants and their food products and adulterants; the reserve food of plants, its form and use, and a systematic study by groups of the plants of economic value and a study of their origin and place of cultivation. Prerequisite, Course 1. Two hours credit. Lecture, one hour, and laboratory, three hours, per week. Fee, $2.00.

11. **Vegetable Physiology.** Sixth semester Horticulture, Agronomy and Science and Agriculture, elective Science and in all other Agricultural Courses. Lectures and laboratory practices on the functions, growth, nutrition, irritability, movements and reproduction of plants. Prerequisite, Course 1. Four hours credit. Lectures, two hours, and laboratory, three hours, per week. Fee, $3.00.

12. **Vegetable Cytology.** Elective Science Courses and Agricultural Courses. A study of the plant cell and its activities, use of various reagents in staining, imbedding, mounting; various cell-like phenomena as they aid in an intelligent understanding of various problems in heridity and as illustrating DeVrie's Theory of Mutations and the relation in general of the hybrid and the cross to the parent. Prerequisite, Course 1 or 27. Four hours credit. Lectures, two hours, and laboratory, six hours, per week. Fee, $3.00.

13. **Agrostology.** Elective Agricultural and Science Courses. A systematic study of the botanical position and economic uses of important grasses, as those used in meadows and pastures, cereal food products, grasses in medicine, as soil binders and for lawn making. Two hours credit. Lecture, one hour, and laboratory, three hours per week. Fee, $2.00.

14. **Seeds and Seed Testing.** Elective Science Courses. Study of principal agricultural seeds and weeds, methods of detection of weeds in commercial seeds, and structure and germinative energy of various seeds. Prerequisite, Course 1. Two hours credit. Lecture, one hour, and laboratory, three hours, per week. Fee, $2.50.

15. **Systematic Phanerogams.** Fourth semester Science and Agriculture, and sixth semester Horticulture, elective Science Courses and Agricultural Courses. Study of the more important orders of flowering

plants; historical survey of various systems of classification; study of groups by means of some representative, the herbarium of the College affording material for this purpose. Prerequisite, Course 1. Three to five hours credit. Lectures, two hours, and laboratory, three to nine hours, per week. Fee, $3.00 or $5.00.

16. **Poisonous Plants.** Second semester Veterinary Course. Study of poisonous plants from historical standpoint, with brief history of toxicology, ptomaine poisoning and poisoning by toxins and other agents—beginning with the poisonous fungi extending through the higher plants in systematic order. The course is intended to acquaint veterinarians with the plants responsible for poisoning animals. Two hours credit. Lecture, one hour, and laboratory, three hours, per week. Fee, $3.00.

17. **Advanced Cryptogamic Botany, Ferns.** Elective Science Courses. Morphological and Systematic study of ferns and their allies. Prerequisite, Course 4. Three hours credit. Lecture, one hour, and laboratory, six hours per week. Fee, $2.00.

18. **Botanical Seminar.** Elective Science Courses. Recent literature and topics of botanical interest are reported and discussed by members of seminar, each member reporting on some assigned topic at least once every two weeks. Lectures are also given by members or by some scientist under the auspices of the seminar. One hour credit.

19. **Evolution of Plants.** Elective Agricultural and Science Courses. Study of theory of evolution of plants, heredity, mutation, Mendelian laws, present and past distribution of plants as related to origin of species. Prerequisite, Course 15. Two hours credit. Recitation, one hour, and laboratory, three hours, per week.

20. **Botanical Microscopy and Micro-Chemistry.** Elective Science Courses. Detailed study of microscope and its accessories and their use in research work; the chemistry of the cell with methods of determination of cell contents and ultimate fate of cell nutrients. Three hours credit. Lecture, one hour, and laboratory, six hours, per week. Fee, $3.00.

22. **Botanical Drawing and Illustrating.** Elective Science Courses. Preparation of drawings to illustrate papers for publication; methods of making drawings and technical requirements of drawings intended for photographic reproduction; use of camera lucida; the determination of magnification and drawing from microscopic mounts. Two hours credit. Lecture, one hour, and laboratory, three hours per week.

23. **Thesis.** Elective. Consists of original research along line of any preceding courses, laboratory work, preparation of bibliographies, reviewing literature pertaining to the subject, and conferences with those in charge. Credit from one to five hours per week.

24. **Plant Embryogeny.** Elective General Science Course. Required eighth semester Horticulture and Science and Agriculture Courses, optional with Physics 404, eighth semester Agronomy Course. The phenomena of cell division, the nuclear changes of the cell at different stages in its growth, a survey of life history of various groups of plants begin-

ning with liver-worts, the gradual development of the alternation of generations in various types, the homologies of the parts of flower and its various contained structures, processes of maturation of germ cells, growth of the gametophytic generation and the final process of fertilization and the consequent development of embryo, cytological explanations of the laws of Mendel, of parthogenesis, of xenia, and polyembryony, also the study and verification of lectures by study of a series of slides. One hour credit. Fee, $1.50.

25. **Microscopical Examination of Foods.** Elective Agricultural Courses. This course embraces a study of vegetable foods from the standpoint of microscopy with especial reference to the adulteration of same. It takes up the histological elements of plants such as tissues and cell contents. A microscopic study of flour, and meal, impurities and adulterations, and the microscopic characters of the cereals such as wheat, oats, and corn. A study of weed seeds and screenings; oil seeds and oil cake. A microscopic study of legumes like the common bean, pea, and vetch; other fruits like the apple, pear, and quince; cucurbit fruits; tubers, spices, and condiments, like pepper, cubebs, cinnamon, nutmeg, and mace. Lectures and laboratory work. Reference book, "The Microscopy of Vegetable Foods," by Winton and Moeller. Two hours per week.

26. **Ecology.** Fourth semester Animal Husbandry Course. Treats of the relation of plants to their environments, under the factors water, heat, light, air, soil, and animals; considering the anatomical structures of plants, especially with reference to environment. The pollination of some economic plants like maize, wheat, clover, rosaceous and leguminous plants; the dissemination of plants. Symbiosis. Myrmecophytes. Two hours credit. One lecture and one laboratory. Fee, $2.00.

27. **General Botany.** Elective General Science Course. A study of the general morphology with a short resume of the systematic arrangements of important members of five divisions of the plant kingdom; also a brief consideration of some of the functions of plants, under the head of the stability of plant bodies, the movements, nutrition, growth and reproduction. Reference books, Strasburger, Noll, Schenck, and Karsten. A text-book of Botany; Stevens' Plant Anatomy. Five hours credit. Lectures, four hours, and laboratory, three hours, per week. Fee, $3.00.

28. **General Botany.** Elective second semester Freshman, Sophomore, Junior or Senior in General Science Course. A study of the special morphology of the plant, beginning with the cell, its structure, parts, the inclusions of protoplasm, such as starch, aleurone, and crystalline matter; a brief account of the ontogeny of the cell and cell fusion; also a study of the tissues and tissue systems and their functions. Prerequisite, Course 7. (Reference books same as Course 27.) Five hours credit. Lectures, four hours, and laboratory, three hours per week. Fee, $3.00.

29. **General Botany.** Required first semester Freshman in Domestic Economy Course. In this course the relation of plants to their environment is considered, and the pollination of flowers by the insects, wind, and

other agencies, dissemination of plants, and a study of the different plant formations. This part of the work will be followed by a study of the use of the microscope, a study of the cell and its contents, such as starch, protoplasm, nucleus, and crystals, tissues and tissue systems. These structures are taken up from physiological standpoint, the use and function of the different plant structures is considered, and the absorbing, assimilating, aerating, and conducting systems are considered. Five hours credit. Four lectures and one laboratory. Fee, $3.00.

60. **Botany of Weeds.** Fifth semester all Agricultural and Science Courses. This is a systematic course of the study of weeds, especially with reference to their injury to farm, garden, and horticultural crops, and the origin and distribution of weeds. Two hours credit. One lecture and one laboratory. Fee, $3.00.

COURSES IN GENERAL BACTERIOLOGY.

30. **General Bacteriology.** First semester Science and Agriculture Course, sixth semester Agronomy and Dairying, eighth semester Horticulture and elective Science Courses and Agricultural Courses. Lectures on the morphology, classification, physiology, and cultivation of bacteria; relation of bacteria to health of man and animals, infection, contagion, immunity, relation of bacteria to decay, as cause of plant diseases and other scientific and agricultural problems. Laboratory work consists of methods of cultivating bacteria, their functions and activities, and of the solution of specific problems, as the bacterial content of air, water, and food with interpretation of results reached. Four hours credit. Lectures, two hours, and laboratory, six hours, per week. Fee, $5.00.

31. **Bacteriology of the Pathogenes.** Fifth semester Veterinary Course. Study of morphology, classification, cultivation, physiological characters of bacteria; study of pathogenic bacteria, especially those infecting domestic animals, their cultural character, the principles of infection and contagion, and the treatment of various theories of immunity as related to bacterial infections; also discussion and preparation of antisera. Two hours credit. Lecture, one hour, and laboratory, three hours, per week. Fee, $5.00.

33. **Technical Bacteriology.** Elective Civil Engineering Course. Study of morphology, relationships and cultural characters of bacteria of water and water supplies, as the common water bacteria, the pathogenic types, and those active in putrefaction and purification, also some of the algae which contaminate water supplies and produce unpleasant odors and tastes; the methods used to determine their presence; qualitative and quantitative tests of waters, and a study of media used in bacterial analysis. Three hours credit. Lecture, one hour, and laboratory, six hours, per week. Fee, $5.00.

34. **Bacteriology of the Pathogenes.** Elective Science Courses. Similar to Course 31, the extended time permitting study of bacteria pathogenic to man as well as to animals. Prerequisite, Courses 30 or 38.

Four hours credit. Lectures, two hours, and laboratory, six hours, per week. Fee, $5.00.

35. Fermentations. Fourth semester Domestic Economy, elective General Science Course. The bacterial decomposition of foods, causes and methods of preventing formation of poisonous products; economic fermentations, as wine, beer, vinegar, koumiss; the vegetable enzymes, their activities and products; molds, bacteria, and yeasts as related to the preservation and fermentation of foods; also the common molds. Two hours credit. Prerequisites, Courses 30 or 38. Lecture, one hour, and laboratory, three hours, per week. Fee, $3.00.

36. Advanced General Bacteriology. Elective Agricultural and Science Courses. Advanced work in the biology and physiology of bacteria, especially certain of pathogenic forms; also the recent investigations in immunity, serum therapy and the prevention of disease. Intended to fit students to do original or special work in experimental, general or pathological bacteriology. Prerequisites, Courses 30 or 38. Four hours credit. Lectures, two hours, and laboratory, six hours, per week. Fee, $5.00.

37. Advanced Sanitary Bacteriology. Elective Science courses. Primarily a study of bacteria of water, study of specific instances of polluted water supplies and of problems that have been solved in the disposal of sewage and other wastes by means of bacteria. Prerequisites, Courses 30 or 38. Three hours credit. Lecture, one hour, and laboratory, six hours, per week. Fee, $5.00.

38. General Bacteriology. Fifth semester Domestic Economy Course. Lecture, one hour, and laboratory, three hours, per week. Fee, $5.00.

39. Thesis in Bacteriology. This work may be elected in this department and taken under any of preceding subjects, the credit varying from one to three hours, depending on the nature of subject and time required.

Graduate Work in Botany and General Bacteriology.

Major or minor graduate work may be taken in this department along any of the following lines.

(a) Advanced Ecology. A study of factors underlying floristic distribution and phytogeographic nomenclature, the relation of plants to environment and a thorough study of economic relationships of some flora, applying the principles named above.

(b) **Advanced Physiological Botany.** A study of some specific problems in plant physiology.

(c) **Advanced Vegetable Cytology and Histology.** A study of comparative anatomy of some group of plants or of some specific problem in cell life and its activities.

(d) **Advanced Systematic Cryptogamic Botany.** A systematic study of some group of the flowerless plants.

(e) **Advanced Systematic Phanerogams.** Study of some group of the phanerogams or of the flora of some locality.

(f) **Advanced Economic Botany.** Study of some specific problem of particular interest, as the adulteration of foods, seeds, geographical botany, etc.

(g) **Advanced Mycology.** A specific study of some group of plant diseases, or of the disease affecting some plant of a group of related plants.

(h) **Water Analysis.**

(i) **Advanced Fermentations.**

(j) **Advanced Bacteriology of the Pathogenes.**

DEPARTMENT OF ZOOLOGY.

HENRY E. SUMMERS, PROFESSOR.
JOSEPH E. GUTHRIE, ASSISTANT PROFESSOR.
C. E. BARTHOLOMEW, INSTRUCTOR.
H. NESS, ASSISTANT.
C. R. SHUMWAY, STUDENT ASSISTANT.

Equipment. The laboratory is well supplied with the usual apparatus, including compound and dissecting microscopes, camera-lucidas, microtomes, incubators, paraffin baths, aquaria, etc. In the way of illustrative material, in addition to the general museum and the entomological collections described below, there is a large series of charts, a set of wax embryological models, lantern slides, mounted microscopic slides, disarticulated and articulated skeletons, and alcoholic and formalin preparations.

The general museum consists of specimens selected with great care to show the variation of structure found in the various branches, classes, and minor divisions of the animal kingdom. Porifera, coelenterata, vermes, echinodermata, arthropoda, mollusca and vertebrata are amply represented by actual specimens and Blaschka glass models. It is especially rich, however, in representative birds and mammals. In addition to a good series of skeletons, there are mounted skins of about two hundred, and eggs of over two hundred species of birds, and over ninety mounted skins of mammals, the latter including such rare or peculiar forms as the echidna, ornithorhynchus, great kangaroo, kaola, wombat, sloth, great ant-eater, armadillo, manatee, peccary, camel, antelope, bison, Rocky Mountain goat and sheep, elk, tapir, porcupine, beaver, fur seal, hedgehog, lemur, and monkey.

The collection of insects is very large, embracing about sixty thousand mounted specimens, including a large number of types. In includes the Van Duzee collection of Hemiptera, including the types of numerous species described by him. There is also a large series of microscopic forms on slides, and a large amount of material illustrating life histories, especially of injurious insects.

The work in Zoology is designed, first, to give a knowledge of those biological laws, together with the data necessary for their thorough comprehension, which is today regarded as an essential part of a liberal education; second, to furnish the requisite theoretical basis for an intelligent study of certain practical branches of stock breeding, dairying, human and veterinary medicine, and economic entomology, which depend directly upon zoological principles; and, third, to impart a knowledge of the facts and methods of investigation in the last of these practical subjects, namely, economic entomology.

COURSES IN ZOOLOGY.

2. General Zoology. Elective General Science Course and Agricultural Courses. Required first semester Sophomore year in Domestic Economy and Animal Husbandry Course. This, together with Zoology 3, is designed to give an outline knowledge of the entire animal kingdom, as well as of the more important biological laws. The laboratory work includes a thorough study of the structure of the grasshopper, followed by a comparative study of certain parts of the beetle. The lectures during the corresponding time deal with those facts in the physiology and life history of insects that will best serve as a foundation for a knowledge of the general laws of animal life. This, followed by a study of the crayfish and crab, gives a basis for comparison between the Crustacea and Insecta. The earthworm is next studied, the lecture work dealing with the relations of animals to their environment. Vertebrates are next studied, the lecture work dealing with the anatomy of the shark and the lectures with general vertebrate physiology, including the fundamentals of embryology. The study of the vertebrate is continued by examination of the perch, necturus, frog, turtle, bird and mammal. The Protozoa are next studied, the lectures dealing with the origin of the physiological functions as exhibited in this group. Then a study is made of selected types of the different phyla of the animal kingdom, taken up in regular order until the vertebrates are again reached. Five hours credit. Lectures, three hours, and laboratory, six hours, per week. Fee, $3.00.

3. General Zoology. Elective General Science and Agricultural Courses. Required fourth semester Domestic Economy and Animal Husbandry Courses. Continuation of Course 2. Five hours credit. Lectures, three hours, and laboratory, six hours, per week. Fee, $3.00.

4. General Entomology. Fifth semester Horticulture and Agronomy, and third semester Science and Agriculture, elective Agricultural Courses and Science Courses. A study of the structure, habits, life history, and classification of insects, designed as an introduction to the subject for those intending to make a specialty of entomology and as a foundation for the practical work in economic entomology offered in Courses 17 and 18. Includes a detailed study of certain representative forms, beginning with the grasshopper, and the field study, collection and classification of as many species as possible representing different orders. The lectures include the general principles of the physiology and development of insects and the detailed life history of representatives of all the different orders. Prerequisite, Zoology 3 or 16. Five hours credit. Lectures, two hours, and laboratory, six hours per week. Fee, $3.00.

5. **Embryology.** Fifth semester Veterinary and Animal Husbandry, elective Domestic Economy, Agricultural Courses and General Science Course. The laboratory work is devoted to a study of the development of the frog and of the chick from preparations made largely by the student, supplemented by others furnished for comparison by the instructor. The methods of making reconstructions from serial sections may be learned. In the lectures the general principles of development are discussed, beginning with the structure of the germ cells, maturation, fertilization, and tracing the modifications of cleavage and gastrulation found in the different classes of vertebrates. Prerequisite, Zoology 3 or 15. Two lectures and one laboratory period per week in Veterinary and Animal Husbandry, two lectures and one to three laboratory periods per week in other courses. Fee, $3.00.

6. **Evolution of Animals.** Eighth semester Animal Husbandry, elective Science Courses and Agricultural Courses. A discussion of problems and factors of organic evolution, heredity, variation, origin, and distribution of life. Prerequisite, Zoology 3. Lecture, one hour per week.

7. **Comparative Anatomy.** Elective Science Courses. Advanced work on the comparative anatomy of the chief systems of organs of vertebrates, designed especially to give an understanding of mammalian morphology as derived from that of lower vertebrates. Prerequisites, Zoology 3 and 5. Five hours credit. Three lectures and two laboratory periods per week. Fee, $3.00.

8. **Animal Parasites.** Sixth semester Veterinary and Animal Husbandry Courses, elective Science and Agricultural Courses. Study of the more injurious parasites of domestic animals. Intended especially for Veterinary students. Prerequisite, Zoology 2 or 15. Two lectures and one laboratory period per week in Veterinary Course, two lectures in Animal Husbandry and Science Courses.

10. **Morphology.** Elective Science or Agricultural Courses. Special individual work in continuation of Courses 2, 3, 5, and 7, or 4, 17, and 18, designed especially for those who expect to become teachers and investigators in Zoology, and who are writing their theses in this department. The work will be given a leaning toward general vertebrate or invertebrate morphology, embryology, or taxonomy, depending upon the inclination of the student. Three to five laboratory periods per week. Fee, $3.00.

11. **Neurology.** Elective Science Courses. The comparative morphology of the vertebrate nervous system, especially the physiological anatomy of the human brain. Prerequisite, Zoology 5. Two lectures and one to three laboratory periods per week. Fee, $3.00.

12. **Human Physiology.** Fifth semester Domestic Economy course and elective General Science Course. Study of the chief functions of the

human body, and the laws of health, preceded by a study of mammalian anatomy, including histology. Prerequisites, Zoology 3 and Chemistry 9. Five hours credit. Three lectures and two laboratory periods per week. Fee, $3.00.

13. **Human Physiology.** Sixth semester Domestic Economy Course and elective Science Courses. Continuation of Course 12. Five hours credit. Three lectures and two laboratory periods. Fee, $3.00.

14. **Advanced Invertebrate Zoology.** Elective Science Courses. Study of the structure and development of representatives of invertebrate groups not fully discussed in previous courses; the embryology and anatomy of Echinodermata, the development of a marine worm, the types of Mollusca, Archmida, and Ascidia. Special attention is paid to modes of respiration, kinds of respiratory apparatus, and also to special sense organs in Pecten, Loligo, etc. Prerequisite, Zoology 5. Two lectures and one laboratory period per week. Fee, $3.00.

15. **General and Vertebrate Zoology.** Third semester Veterinary Course. A study of the anatomy of the grasshopper gives a knowledge of zoological laboratory methods as well as the general structure of insects; a study of the anatomy of the shark serves as an introduction to methods of gross dissection, and of the general morphology of vertebrates. Other vertebrate types, especially the necturus, are studied. The lectures include general animal physiology, and an outline of the comparative anatomy of some of the chief organs of the vertebrates and of elementary vertebrate embryology. Five hours credit. Lectures, three hours, and laboratory, two periods per week. Fee, $3.00.

16. **General Zoology.** Fourth semester Horticulture, Agronomy and Science and Agriculture Courses. This course is intended to serve as an introduction both to general animal morphology and physiology, and to the more special work in Entomology required of students in the above courses. The study of the grasshopper in the laboratory, followed by that of a fish, usually the shark, serves as a foundation for the lecture work on the general principles of Zoology, including physiology and development. Five hours credit. Lectures, three hours, and laboratory work, six hours per week. Fee, $3.00.

17. **Economic Entomology.** Elective Agricultural and Science Courses. Intended particularly for students in Horticulture and Agronomy. A detailed study in field, insectary, and laboratory of the chief economic species of insects found in Iowa, accompanied by a study of the literature relating to the other more important American species. This course forms the first part of a study of the life histories of our common species of insects which it is necessary to begin in the spring, and which cannot be completed until autumn. It must therefore be followed by Course 18 in the succeeding autumn. Credit towards graduation is not given for either of these two courses separately. Prerequisite, Zoology 4. Three hours credit. Two lectures and three hours laboratory work. Fee, $3.00.

18. Economic Entomology. Elective Agricultural or Science Courses. This course is described above under 17. Two hours credit. Six hours laboratory work. Fee, $3.00.

SPECIAL COURSES.

In addition to the above, special courses will be offered to students intending to write a thesis in Zoology, and also to graduate students in continuation of the work pursued as under-graduates. Special facilities will be offered for such research work. No one will be permitted to write a thesis in this department who has not completed by the end of the Junior year, work in the line in which he wishes to carry on his thesis investigation, at least up to or including Courses 7, or 3, 17 and 18, or 12 and 13, or 14.

DEPARTMENT OF GEOLOGY.

SAMUEL WALKER BEYER, PROFESSOR.
IRA A. WILLIAMS, ASSOCIATE PROFESSOR.

The work of this department is conducted by means of recitations, lectures, conferences, laboratory work, and field excursions. The student is thus afforded an opportunity not only to gain a familiarity with the principles and theories discussed in the leading text-books, but is also encouraged to test these theories and verify the principles discussed in the class room. Field excursions, with carefully written reports are required in all the courses in Geology.

The department of Geology together with the department of Mining Engineering occupies quarters in Engineering Hall. The working equipment consists of museum materials, field and laboratory instruments.

The museum contains carefully selected series of fossils, minerals, rocks and ores, all available for study purposes. Among the more important collections are the educational series of rocks collected by the United States Geological Survey; the Smithsonian collection of rocks and minerals; the Rohn, Hodson and Young collections of rocks and ores from the Lake Superior region; the English mineral collection, containing two hundred specimens and one hundred and fifty species; the Baltimore series of more than two hundred specimens of rocks and minerals typical of the petographic province of Baltimore; the Cushing collection from Clinton County, New York; and a considerable amount of material to illustrate the physical features of rocks and minerals.

In paleontology, the Calvin collection of paleozoic fossils; a large collection of Coastal Plain fossils, principally from the Cretaceous of New Jersey, the Eocene of Alabama and Maryland, and the Miocene of Maryland and Virginia; the Permo-Carboniferous series from Kansas and Russia; and the coal plants of Iowa, Illinois and Pennsylvania are the most important.

In applied Geology the department possesses comprehensive series of lead and zinc ores with their characteristic gangue minerals from Joplin, Missouri, and from the Iowa-Wisconsin area; copper and iron from the Lake Superior region and from the celebrated localities in the Ural mountains; copper, manganese and silver from Butte, Montana; lead, silver and gold from Colorado, Nevada and California.

Aside from the collections enumerated, Dr. H. Foster Bain, formerly of the Iowa Geological Survey, has kindly loaned to the department his extensive private collection of rocks and minerals; and the Le Grand Quarry Company generously donated a splendid series of building blocks from their quarries which exhibit the various styles of stone dressing.

The laboratory is supplied with four Bausch and Lomb petrographical microscopes; one Fuess, medium model, latest pattern petrographical microscope. All of the instruments are well supplied with accessories; one Ward mineral dresser, one hand goniometer; one set Preston's celluloid crystal models; one set Krantz selected wood models, exhibiting complicated forms; the Krantz collection of 120 thin sections of the common rock-forming minerals selected and arranged according to Rosenbusch, the collection selected to show the various representative characters of minerals and rocks; one section slicing machine, the complete apparatus for rock separations by heavy solutions; and is supplied with apparatus for doing all kinds of photographic work. A considerable number of instruments for reconnoissance and field work in Geology are owned by the department.

The lecture equipment comprises a Hitchcock's geological map of the United States; one set of Kiepert's physical maps; numerous maps and charts of the United States Geological Survey and of the Mississippi River Commission and an elaborate series of lantern slides and photographs.

COURSES IN GEOLOGY.

All of the courses in Geology save numbers 2, 803 and 6 are designed especially to meet the requirements of students who elect the courses in Mining Engineering and Ceramics. At the same time the courses given will afford a good groundwork for students who expect to teach the subject or make Geology their profession. Course 803 is especially adapted for students in Civil Engineering who have not the time to take the more complete work. Course 6 is offered for those who desire a broad view of world geography and it is hoped to make the course helpful to those who expect to teach History, Politics, Geography or Geology.

2. General Geology continued: Optional sixth semester all courses in Science and Agriculture. Historical and Stratigraphic geology. A continuation of Course 501, and completes the work in general geology.

Prerequisites, Geology 501, and one or more semesters work in Zoology and Botany. Four hours per week. Three recitations and lectures, and one class hour devoted to laboratory and field work.

6. **Advanced Physiographic Geology.** Elective in all courses in Science and Agriculture. This course is devoted to a study of the evolution of the physical features of the earth, and the leading agencies which influence their developments. Prerequisites, elementary courses in Chemistry and Physics. Four hours per week. Three recitations, and one laboratory or field period per week.

9. **Meteorology and Climatology.** Elective Agricultural and Science Courses. The object of the course is to give the student a knowledge of the fundamental principles which govern weather and climate. The first half of the term is devoted to a study of the elementary principles of meteorology. The student is acquainted with the instruments used by the weather bureau, the principles upon which they are based, and their care and uses are explained. The last half of the term is given to a consideration of the fundamental principles which control weather and climate. Throughout the entire course the charts and maps issued by the state and federal weather bureaus are used freely. The student is given practice on the construction and interpretation of charts and in forecasting. Two hours credit.

Geology 10. Seventh semester Agronomy, Horticulture and Forestry Courses, and elective Agricultural Courses. The work includes a careful consideration of the principles of dynamic and structural geology, with especial reference to the origin of soils and the surface features. Text-book, "Norton's Elements of Geology." Four hours credit.

501. **General Geology: Dynamic, Structural and Physiographic Geology.** Fifth semester Mining Engineering and Ceramics, elective Science Courses; seventh semester Horticulture and Forestry Course. The course includes a study of the principles which form the groundwork of the Science and is given by means of recitations, lectures, laboratory, and field work. Prerequisites, one or more semesters each of Chemistry and Physics. Text-book, Scott's Introduction to Geology, 2nd Edition. Four hours credit, three of which are devoted to recitations and lectures, and one to laboratory and field work.

607. **Mineralogy.** Sixth semester Mining Engineering Course, and elective all courses in Science and Agriculture. The first half of the term is devoted to a study of the morphological and physical characters of crystalline substances, while the last half is devoted to descriptive and determinative mineralogy. Prerequisites, elementary courses in Mathematics, Chemistry and Physics. Four hours credit. Four two hour sessions.

704. **Advanced Geology.** Seventh semester Courses in Mining Engineering and Ceramics, and elective courses in Science and Agriculture. Petrologic and Advanced Structural Geology. The first ten weeks of the term are devoted to a study of rocks, their origin, occurrence and as-

sociation, and the last six weeks to a discussion of principles and problems in Structural geology. Prerequisite, Geology 501 and 803. Four hours credit. Three hours class work, and one laboratory or field period per week.

803. Engineering Geology. Eighth semester Civil Engineering Course. The course includes a discussion of the fundamental principles of dynamic and structural geology and a study of the common minerals and rocks, especially those important in structural materials. Prerequisites, Elementary Chemistry, Mechanics and Heat. Text-book, Scott's Introduction to Geology, 2nd Edition. Three hours credit. Recitations and laboratory work.

805. Economic Geology. Eighth semester, courses in Mining Engineering and Ceramics, and elective in all courses in Science and Agriculture. The first ten weeks includes a study of the nonmetallics while the remainder of the term is devoted to a study of the ore deposits of the United States, Canada and Mexico. Especial stress is put upon the principles which govern the mode of occurrence, association and origin of the leading economic products. Prerequisites, Geology 501 or 803, and 704. Four hours credit. Consists of three recitations and one laboratory or field period per week.

808. Thesis. Students in Mining Engineering electing to write a thesis in geology are required to take five hours special work in geology during the eighth semester. This special work may be along any one of the following lines: Economic Geology, Petrology, Dynamic Geology, Structural Geology, Metamorphism, Historical Geology or Stratigraphic Geology.

DEPARTMENT OF ECONOMIC SCIENCE.

BENJAMIN H. HIBBARD, PROFESSOR.
JOHN E. BRINDLEY, ASSISTANT PROFESSOR.

Economic Science has become a well recognized part of almost all scientific and technical education, because it has made itself useful in investigating and interpreting the material phenomena and facts of every day life; inductive methods are given first place, deduction being used with caution.

It is the purpose of the department to develop courses of special value to the technical departments of the college. Agricultural and engineering economics are receiving primary attention, and it is believed that the work done in these classes will be helpful in meeting the growing economic problems of the state.

1. Outlines of Economics. Elective in all Science and Agricultural Courses. In this course a text is followed, and additional work supplied by lectures. Five hours credit.

3. Economic Problems. Elective in all Agricultural and Science Courses. Study of socialism, monopolies and trusts. Text-book, Ely's

"Socialism and Social Reform." Prerequisite, Course 1 or 9. Three hours credit.

4. **Money and Banking.** Elective in all Agricultural and Science Courses. Text-book, White's "Money and Banking," supplemented by reading, reports and lectures. Prerequisite, Course 1 or 9. Two hours credit.

5. **Finance.** Elective in all Agricultural and Science Courses. Text-book, Adams' "Science of Finance." Prerequisite, Course 1 or 9. Three hours credit.

6. **Industrial History of United States.** Elective in all Science and Agricultural Courses. Lectures and class reports. Prerequisite, Course 1 or 9. Two hours credit.

7. **American Labor.** Elective in all Agricultural and Science Courses. A study of labor questions by class reports and lectures. Prerequisite, Course 1 or 9. Two hours credit.

9. **Outlines of Economics.** Third semester Dairying, Science and Agriculture, and Horticulture and Forestry, and fifth semester Agronomy and Agricultural Engineering Courses, seventh semester Mechanical and Electrical Engineering Courses, and elective Agricultural and Science Courses. Text and lectures. Three hours credit.

10. **Agricultural Economics.** Elective Agricultural Courses. This course will consist of lectures and class reports. The topics discussed will include historical and comparative agricultural systems; land tenure; size of farms; coöperation; taxation; prices; transportation; marketing; land credit, the relation of the state to agriculture. Prerequisite, 1 or 9. Three hours credit.

11. **State and Local Taxation.** Elective in all Science and Agricultural Courses. This is primarily a research course, the work being conducted in the form of lectures and class reports. Special attention is given to taxation in Iowa. Prerequisite, Course 5. Two hours credit.

12. **Engineering Economics.** Optional in Engineering Courses. The economic side of transportation will be given a prominent place. The industrial aspects of irrigation, improvement of inland waterways, municipal utilities, etc., will be studied. An earnest effort will be made to shape this course so as to meet the special needs of engineers. Prerequisite, Course 1 or 9. Two hours credit.

13. **Seminar.** Elective to students who have had not less than two previous courses. The purpose of this course is to awaken interest in the general field of economics by following the current events and reading economic magazines. A sketch of economic thought is presented in lectures. One hour credit.

14. **Outlines of Economics.** Sixth semester Civil Engineering Course. Elective Science Courses. Two hours credit.

15. **Engineering Economics.** Required sixth semester in Five Year Courses in Engineering, elective in other Engineering Courses. The economic side of transportation will be given a prominent place. The industrial

aspects of irrigation, improvement of inland waterways, municipal utilities, etc., will be studied. An earnest effort will be made to shape this course so as to meet the special needs of engineers. Prerequisite, Course 1 or 9. Three hours credit.

DEPARTMENT OF DOMESTIC ECONOMY.

ALICE DYNES FEULING, PROFESSOR.
HELEN DONOVAN, ASSOCIATE PROFESSOR.
MISS BERTHA MOORE, ASSISTANT PROFESSOR.
MABEL CAMPBELL, INSTRUCTOR.
EDITH G. CHARLTON AND NEALE S. KNOWLES, EXTENSION WORKERS.

The widespread interest in Domestic Economy springs largely from the increasing attention accorded to all social problems. The importance of the home as a social factor is paramount; and the application of science and of the scientific method to household management is coming to be regarded as a necessity. It is not surprising therefore that the study of the home, its functions, its administration, its sanitary conditions, the preparation of foods, and a score of kindred topics should find place in the courses of instruction in colleges and universities. The study of Domestic Economy is profitable not only because of its practical worth, but because of its educative value. Many sciences find direct application in the operations of housekeeping; it is consequently the aim of this department to present this home study in such a way as to apply the knowledge gained in related and associated sciences. This study seeks at every point the health, convenience and comfort of the members of the household, and by its utility to add to the value of the well kept home.

The methods of instruction embrace the lecture system, text-book study, laboratory practice, demonstration lessons, class discussions, presentation of topics on assigned subjects by individual members of the class, and expeditions for observation and criticism. By a judicious combining of theory and practice, science and art, the student gains a thorough understanding of the underlying principles of Domestic Economy and at the same time acquires skill and deftness in execution. Upon completing a systematic course in this department a young woman is prepared to conduct her home successfully and with that ease which comes only through knowledge and experience.

The work of the Domestic Economy department is that of applying the principles of the related sciences, Botany, Zoology, Chemistry, Physiology and Physics to the every day problems of the home. It does not constitute a special and separate course of study, but is one of the several lines included in the general College courses offered to women students and subject to the usual regulations concerning entrance requirements, classification, examinations, and class records.

Students are advised not to enter in the second semester for the purpose of taking beginning work in Domestic Economy, for there are no beginning classes at that time. The work of the second semester is a continuation of the work of the first semester.

Domestic Economy 8, 22, 23, 35, 36, 37 and 38 give science credit in Junior or Senior years in General Science course.

A course in Domestic Economy is offered during the winter vacation for the benefit of the women of the state who are unable to take a college course. Lessons, including actual laboratory work, in sewing cooking and chemistry of foods are offered. Lectures are given in home nursing, home decoration and artistic dress. There are no prerequisites for this course. Fee, $3.00.

This department employs two extension workers who teach Domestic Economy throughout the state under the direction of the Agricultural Extension Department.

COURSES IN DOMESTIC ECONOMY.

Domestic Science.

8. Laundry Work. Seventh semester Domestic Economy Course, and elective General Science Course. Study of soaps, washing fluids, bleaching powders, bluings and starches; their scientific and practical relation to laundry work, also actual work in the laundry. Prerequisite, Chemistry 24. One hour credit. Laboratory, one period per week. Fee, $3.00.

9. Theory and Practice of Teaching Domestic Science. Elective Domestic Economy Course. Treats of the purpose of Domestic Science in education, its relation to other subjects in the curriculum, methods of presentation, planning courses of study. Plans for furnishing and equipping laboratories in the various classes of schools and cost of same. The laboratory work consisits of teaching public school classes. Prerequisite, D. E. 35. Two hours credit. Recitation, one hour, and laboratory, one period per week. Fee, $3.00.

10. Theory and Practice of Teaching Domestic Science. Elective Domestic Economy Course. Continuation of D. E. 9. Two hours credit. Recitation, one hour, and laboratory, one period per week. Fee, $3.00.

22. Sickroom Cookery and Home Nursing. Eighth semester Domestic Economy and elective General Science Course. A course of lectures including the furnishing, warming, and ventilating the sick room; bathing, dressing and administering food and medicine to patients; practical bandaging and bed making, lifting and caring for helpless patients; preparation and application of bandages, and the preparation of nourishing, palatable, and digestible dishes. Prerequisite, D. E. 36. One hour credit. Laboratory, one period per week. Fee, $3.00.

23. Home Management. Eighth semester Domestic Economy and elective General Science Course. Includes care of dining room and pantry, cut glass, silver and cutlery; planning, buying, preparation and serving of breakfast, luncheon and dinners; food as an economical factor, the administration of the home. Prerequisite, D. E. 36. One hour creit. Laboratory, one period per week. Fee, $5.00.

27. **Household Accounts.** Seventh semester Domestic Economy. One laboratory period. One hour credit.

30. **Seminar.** Elective Domestic Economy Course. History of Domestic Economy movement and its effect upon education; the Domestic Economy work in other colleges and institutions of learning; its function in charity organizations, church work, Y. W. C. A., and public schools; special problems for investigation are assigned. One hour credit. Recitation, one period per week.

35. **Food and Dietetics.** Sixth semester Domestic Economy and elective General Science Course. A study of the food principles, carbohydrates, proteids, fats and mineral matter; their chemical composition, digestibility, nutritive value and cost; the effects of cooking and the best methods of preparing and serving foods from a sanitary and dietetic standpoint; making standard dietaries appropriate to various conditions of occupation, climate, age, and sex with limited cost; a study of foods suitable for old people and for children; the ethics of the dining room. The laboratory work includes a complete course in practical scientific cooking and serving of foods. This course aims to train students in the proper care and use of kitchen and dining room with their utensils and equipment. Emphasis is placed upon system, accuracy, neatness and skill. Prerequisite, Zoology 12. Five hours credit. Recitations, three hours, and laboratory, two periods per week. Fee, $7.00.

36. **Food and Dietetics.** Seventh semester Domestic Economy and elective General Science Course. Prerequisite, D. E. 35. Five hours credit. Recitations, two hours, and laboratory, three periods per week. Fee, $10.00.

37. **Home Sanitation.** Sixth semester Domestic Economy and elective General Science Course. Study of location and surroundings of he house, its plan, furnishing, and care from the sanitary standpoint, ncluding drainage, disposal of household waste, heating, lighting, ventiating and water supply. Prerequisite, Botany 38. Two hours credit. Recitation, two hours per week.

38. **Geography of Foods.** Eighth semester Domestic Economy and lective General Science Course. A study of production, transportation, reparation, adulteration and consumption of foods, also their market alue as compared with food value. Prerequisite, D. E. 36. Two hours redit. Recitation, two hours per week.

Domestic Art.

1. **Clothing.** First semester Domestic Economy and elective Genal Science Course. This course is designed to give knowledge of the rious uses of hand and machine sewing, the use of patterns, the acrate taking of measurements, economical cutting of material, the

making of garments. A study is made of the various fibres, the development of spinning and weaving, modern processes of manufacture, comparison of fabrics, economic values. Two hours credit. Recitation, one hour and laboratory, one period per week. Fee, $1.00.

4. **Clothing.** Second semester Domestic Economy and elective General Science Course. Continuation of D. E. 1. Two hours credit. Recitation, one hour, and laboratory, one period per week. Fee, $2.00.

6. **Costume.** Third semester Domestic Economy and elective General Science Course. In this course each student makes an unlined clot shirt waist suit. Lectures deal with the history of costume in its relatio to modern dress, healthful and appropriate clothing, the work of the Consumer's League. Prerequisite, D. E. 4. Two hours credit. Recitation one hour, and laboratory, one period per week. Fee, $1.00.

7. **Costume.** Fourth semester Domestic Economy and elective General Science Course. Each student makes a light summer dress and thi white shirt waist. Topics for discussion: Art principles applied to costumes, color in its relation to dress, the effect of different textiles, artisti dress. Prerequisite, D. E. 6. Two hours credit. Recitation, one hour and laboratory, one period per week. Fee, $1.00.

11. **History of Art.** Elective Domestic Economy and General Science Courses. Architecture and Sculpture. The organic and typica forms of architecture are studied with relation to their origin, characte and development, and their particular adaptation to the existing condition as to building materials and the needs and ideals of men. Sculpture i studied for its own perfection of beauty and grace and its use as an adjunct of architecture. Two hours credit. Recitations, two hours pe week.

12. **History of Art.** Elective Domestic Economy and General Sc ence Courses. Continuation of D. E. 11 with Painting as principal su ject. Two hours credit. Recitations, two hours per week.

13. **Home Decoration.** Eighth semester Domestic Economy an elective General Science Course. The principles of construction, orn mentation and color harmony are applied to furnishings and utensils ar to the treatment of walls, floors and ceilings by means of lectures a specimens of textiles, wall papers, pottery, fine glass and silver. Pr requisite, D. E. 37. One hour credit. Recitation, one hour per week.

14. **Theory and Practice of Teaching Domestic Art.** Electi Domestic Economy Course. This course considers the place of domest art in education, its relation to the curriculum, problems of subject ma ter and of method, development of lesson plans. Practical work consis of assistance and teaching in public school classes. Prerequisite, D. E. Two hours credit. Recitation, one hour, and laboratory, one period p week. Fee, $3.00.

32. **Theory and Practice of Teaching Domestic Art.** Electi Domestic Economy Course. Continuation of D. E. 14. Includes planni of courses for various schools, the problems of planning, furnishing, a

equipping departments, relation to cost, the collection and use of illustrative materials. Prerequisite, D. E. 14. Two hours credit. Recitation, one hour, and laboratory, one period per week. Fee, $3.00.

DEPARTMENT OF PSYCHOLOGY.

ORANGE HOWARD CESSNA, PROFESSOR.

Courses in Psychology, Principles of Education and Child Study.

NOTE.—Candidates for the State Teacher's Certificate should plan to take the following courses: Psychology 1, 5 and 6. History 20 and 21, History of Education. Psychology 1 should be taken during the Junior year if possible. Consult Professor Cessna before classifying.

1. **Descriptive Psychology.** Elective in all Agricultural and Science Courses. This course treats of the elements and outlines of Psychology, and is designed as an introduction to the other courses in psychology and principles of education and child study. Standard texts are used, such as those by Angell, James, and Tichener, together with Seashore's Manual of Experimental Psychology, supplemented by lectures and illustrative experiments before the class. This course is so arranged as to meet the requirements for the State Teacher's Certificate. Five hours per week.

2. **Ethics.** Elective Agricultural and Science Courses. This course covers both theoretic and practical ethics and is based on standard texts such as MacKenzie's and Muirhead's, Dewey & Taft's Manuals. The text-books are supplemented by library work and lectures. Recitations, three hours per week.

3. **Advanced Psychology.** Elective Science and Agricultural Courses. This course treats of some of the advanced phases of psychology, as suggestion, hypnotism, the subconscious self and the psychology of the crowd. Text-book, lectures and laboratory work. Prerequisite, Psychology 1. Three hours per week.

4. **Educational Psychology.** Elective Domestic Economy Course. This course is especially arranged for the Domestic Economy students. It is a brief course dealing with the practical psychological problems of teaching. It is based on James's "Talks to Teachers" and Bett's "The Mind and Its Education." Text-book, lectures and assignments. Three hours per week.

5. **Principles of Education and Child Study.** Elective Agricultural and Science Courses. This course treats of the psychological principles of education, including the general laws of the growth of the mind and the educational aspects of various mental phenomena, also the general phases of child study. It is based on such texts as Bolton's Principles of Education, Horne's Psychological Principles of Education, and Kirkpatrick's Fundamentals of Child Study. Three hours per week.

6. **Principles of Education and Child Study (continued).** Elective Agricultural and Science Courses. This course is a continuation of

Psychology 5, which must be taken as a prerequisite. Three hours per week.

DEPARTMENT OF LITERATURE AND RHETORIC.

ALVIN B. NOBLE, PROFESSOR.
MISS MACLEAN, ASSISTANT PROFESSOR.
MISS MOORE, MISS TOMPKINS, AND MISS VAULX, ASSISTANT PROFESSORS.
MR. RAYMOND, MR. FOSTER, MISS MORRIS, MISS SAFFORD, AND MISS RUNDALL, INSTRUCTORS.
MISS FLORENCE A. ARMSTRONG, ASSISTANT.
MISS EDNA EVERETT, AND MR. CHARLES MURRAY, STUDENT ASSISTANTS.

In the courses in English two ends are sought, utility and culture. Utility predominates in the first years and culture in the last, though there is hardly a recitation but contains something of both.

So long as man communicates his thoughts and feelings to his fellows, so long will language have a practical value. The man who speaks in a bungling manner, only half succeeds in communicating his thoughts to others. If they catch his real meaning they do it by a happy inference of their own as to what he meant to say. But no man can afford—certainly no college man can afford—to depend on others to correct his own faulty speech. If he uses the wrong word, arranges the parts of the sentence improperly, gives some part an undue emphasis, or fails to indicate clearly the bearing of one sentence upon another, his language does not truly present his thought, and the world may profit little from his attempt to state it. The more valuable his thought, the greater his need for a clear and effective use of language.

If the student has mastered grammar and rhetoric, that is, if he has been trained to *apply* the principles gone over, his speech should be free from errors and inaccuracies of expression. More than this; if he has been directed to the study of good models, if he has been taught no merely to correct what is faulty, but also—and this is far more importan —to appreciate what is excellent in diction, in sentence structure, in th development of paragraphs and of whole compositions,—if he has bee made to feel the increased utility, the beauty, and the power of languag as used by the masters of expression, he will not be content to us language that has only the negative merit of being without faults, bu will press on to attain a style enriched by the presence of real excellence a positive quality. Such language is not simply clear and accurate, it i pleasing and powerful, and the man who has acquired such skill in th use of language has greatly increased his influence in the world. If he ca give his valuable thought an adequate expression, his fellows will learn th thought from him, and give him honor accordingly; if he cannot, the will learn it from one who can state it more clearly or more attractivel and the reward is quite as likely to go to the man who best states th thought as to the one who first discovers it.

The courses in grammar, rhetoric, and composition are devoted primarily to this utilitarian end. The facts and principles of language are studied, not as valuable in themselves, but as useful when applied in spoken or written discourse. To this end the student is required to write much, always with some definite object to be accomplished, and usually with some good model before him to inspire him to more earnest effort. When once he has learned to draw from his reading suggestions that will be helpful in his future compositions, he has found a possible utility in everything he studies as literature and has opened the door to continual improvement. Moreover, in learning to appreciate what is best in the models set before him, he gains insensibly something of culture as well as utility.

The course in debating is designed as a training toward the effective discussion of live topics. Wherever he goes the college graduate is expected to have opinions of his own on the topics of the day, to be able to state them clearly and forcibly, and, if need be, to defend them. To this end he should train himself to close analysis of complex problems, to a severe testing of every conclusion, his own as well as other people's. Moreover, the public will not wait for him to retire to his study for labored preparation. They expect him to be ready when the occasion calls, and they have generous rewards for the man who is ready—ready to map out a clear-cut line of argument, ready to support it with proofs, and able to present it clearly and forcibly in off-hand discussion. Such readiness comes only from long-continued right-thinking and clear-speaking. It is the aim of this course to start the student toward this goal.

In the courses in Literature it is probably true that the culture side predominates, yet utility is seldom lacking. The study of Literature calls for close observation, correct inference, fine discrimination. When the mind is trained to do such work, it acquires a power that abides, a power that can be applied to any task. Literature deals with the whole range of human experience, emotion, activity. In studying Literature, therefore, we are required to give some study to the mind and heart of man. If such study does not exert an elevating influence, it can only be because the reader does not choose the best, or does not approach the work in the right spirit. At the very least it ought to give him a deeper insight into human nature, and that is no small gain. But Literature is also an art, an art that engages the attention of more people, and holds that attention for a longer time than does any other art. In studying it, therefore, we are cultivating the aesthetic sense, a part of our nature not appealed to by most studies. Best of all, perhaps, it brings us into the company of the rarest minds of all times; it gives command of the best thought of the best minds; it brings to us the "blessed companionship of wise thoughts and right feelings." It broadens the mind, quickens the imagination, enlarges the sympathies, enriches the whole nature.

COURSES IN ENGLISH.

Academic Courses.

1. **The Sentence.** Required for entrance to all Academic Courses by students who lack a thorough knowledge of sentence structure and sentence relations. Taught both semesters. This course is equivalent to the Grammar Review which has been recommended to the high schools of Iowa by the English Teachers' Round Table and the State Teachers' Association for the last year of the high school course. It assumes as a prerequisite such knowledge of grammar as students are supposed to obtain in the graded school and the first year or two of the high school, supplemented by two or more years of Latin, German, or other foreign language. It includes a review of the fundamentals, such as (a) the parts of speech, with their respective subdivisions; (b) inflections; (c) sentence functions and relations, such as subject, verb, complement, modifiers, prepositional and conjunctive elements, etc. The student is expected to have sufficient preparation to enable him to do this review work rapidly, in order that the major part of the term may be given to advanced work. This advanced work will include (a) correction of common errors; (b) study of the principles of punctuation, with drill in applying them; (c) copious analysis of good modern prose, with emphasis on phrases and clauses as structural elements in the sentence, and careful study as to correct and effective position and connection; (d) daily drill in sentence construction, in applying and supplementing what the student has been taught to observe in analysis; (e) original composition, with emphasis placed upon constructing clear and effective sentences of all types,—long, short, balanced, loose, periodic, and climactic. This course is designed to give the student that ready command of the sentence that shall leave him free to seek excellence of structure without needing to give conscious thought to correctness. Text-book, Buehler's Modern English Grammar. Five hours credit. Fee, $.25.

2. **Rhetoric and Composition.** "A" semester Academic year in all courses. This course assumes that the student has already had the major part of the ordinary high school course in rhetoric and composition, and also in literature. It emphasizes paragraph structure, the making of outlines, and the careful analysis of good models, accompanied by numerous exercises and essays designed to apply the methods just analyzed. Prerequisites, English 1 or its equivalent, with the major part of a high school course in rhetoric and composition, and also in literature. For the first ten days there will be a rapid review of grammar, with essays on simple themes. Students who show the need of further review will be required to make up the deficiency. Text-book, Scott & Denny's "Composition—Rhetoric." Five hours a week.

9. **English Classics.** "B" semester Science Courses. A course in literature intended merely to supplement and complete the study for those who have not finished a fully accredited four-year high school course.

It is taken up mainly as an approach to a more intelligent and discriminating appreciation of literature and an incentive to a wider and more thoughtful reading. Prerequisites, English 1 and 2, or their equivalent, and the major part of the course in literature in a fully accredited high school, or its equivalent. Five hours credit.

12. English Classics. "B" semester in all Agricultural and Engineering Courses. A course in literature intended merely to supplement and complete this study for those who have not finished a fully accredited four-year high school course. It is taken up mainly as an approach to a more intelligent and discriminating appreciation of literature, and an incentive to a wider and more thoughtful reading. The authors and works studied will be selected with the view of repeating as little as possible what the students have already studied. Prerequisites, English 1 and 2, or their equivalent, and the major part of the work in literature in a fully accredited high school, or its equivalent. Four hours credit.

COLLEGE COURSES IN ENGLISH.

7. Debating. Elective in all courses. A course in stating and defining questions for debate, in making briefs, and in extemporaneous debating; the application of argumentative principles and methods to live topics. Prerequisites, the old courses, English 3, 4, 5, and 6, or the new courses, English 10, 11, and 12. One hour credit.

8. Debating. Elective in all courses. Continuation of Course 7. One hour credit.

10. Narration and Description. First semester in all courses. A study of good models in these two forms of discourse, with lectures on the principles to be observed and the methods to be employed; careful attention to making plans and outlines; an essay once a week, with an exercise almost daily, with constant emphasis on the ability of the student to apply in his own composition the principles studied. Prerequisites, English 1, 2, and Literature 9 or 12, taken in class or by examination, or diploma from a fully accredited high school. The first ten days will be given up to a rapid review of grammar, and essays on simple themes. Three hours credit. Fee, $.75.

11. Exposition. Second semester in all courses. Study and practice in expository writing, following the same general method as in Course 10. Prerequisite, Course 10. Three hours credit. Fee, $.75.

12. Argumentation. Third semester in all Engineering Courses, General Science, Agronomy, Dairying, Science and Agricultural Courses, fourth semester in the Animal Husbandry and Horticultural Courses, seventh semester Agricultural Engineering Course. Elective Domestic Economy Course. A study of the principles of argumentation, with analysis of good models. Practice in making briefs and in writing forensics. Prerequisite, English 11. Two hours credit. Fee, $.50.

13. Advanced Composition. Elective in all Agricultural and Science Courses. A course in composition in any of the forms of discourse, each student writing along the line of his own needs and interests. In part daily themes and in part longer papers based on literary reading and original research. Two hours credit.

COLLEGE COURSES IN LITERATURE.

1. **English Drama.** Elective in all Agricultural and Science Courses; also in the Sophomore year Domestic Economy Course. Devoted mainly to a study of Shakespeare, with a rapid survey, largely by reports and informal lectures, of the English Drama before his time, and a rapid reading of a few dramas of subsequent time. In Shakespeare three or more plays will be studied carefully and others read rapidly. Character analysis and interpretation, with grouping and contrast. Plot analysis, with stages of complication and resolution. Prerequisite, English 11. Three hours credit.

2. **Epic and Lyric Poetry.** Elective in Science Courses, and Agricultural Courses. A course in English poetry, excluding the drama. Principal attention given to Milton, Wordsworth, Tennyson, and Browning, with minor attention to Dryden, Pope, Burns, Coleridge, Shelley, and Keats. Classification of the various forms of poetry. Study of rhythm, meter, rhyme, alliteration, figures of speech, melody, harmony, etc. Principles of criticism applicable to the poems studied. Prerequisites, English 10 and 11. Literature 1 or 5, though not strictly necessary, will be of great help. This course may be divided into two parts, as Literature 10 and Literature 11. Five hours credit.

3. **Novel and Romance.** Elective in all Agricultural and Science Courses. A course in the novel and romance from the eighteenth century to the present time; differences between the two forms; comparison with the drama; plot and character analysis; an outline for systematic study. Prerequisites, same as in Literature 2; Literature 6 will also be of help. Three hours credit.

4. **American Literature.** Fifth semester Science and Agriculture Course, elective in all Agricultural and Science Courses. A study of our best poets and essayists; comparison with English authors and works; interrelations of our literature and history; includes the prominent writers of the present day. Prerequisites, English 10 and 11; Literature 2 will be of help. Three hours credit.

5. **Drama.** Elective Domestic Economy Course, and General Science Course. Combination of Courses 1 and 8. Prerequisites, English 10 and 11. Five hours credit.

6. **The Short Story.** Elective in all Agricultural and Science Courses. A study of the short story from the time of its development as a distinct literary form to the present time; the various types and classes of the short story, with principal attention to the product of the last fifty years in France, England, and the United States. Prerequisites, English 10 and 11; Literature 1 or 5 is strongly urged as a preparation for this course. Two hours credit.

7. The Essay. Elective in all Agricultural and Science Courses. The leading English essayists, as Addison, Steele, De Quincey, Macaulay, Carlyle, Ruskin, and Matthew Arnold. Prerequisites, English 10 and 11. Two hours credit.

8. The Drama in Translation. Elective in all Agricultural and Science Courses. A study of the leading Greek, French, and German dramas through an English translation. May be taken as a part of Course 5 or independently. Prerequisites, the required courses in English. Two hours credit.

10. Epic and Lyric Poetry, 19th Century. Elective in all Agricultural and Science Courses; also in Sophomore year in Domestic Economy Course. Chief attention given to Wordsworth, Tennyson, and Browning, with a more rapid study of Coleridge, Keats, Shelley, and some of the later English poets. A part of Course 2, but may be taken independently. Prerequisites, English 10 and 11. Three hours credit.

11. Epic and Lyric Poetry, 16th, 17th, and 18th Centuries. Elective in the same courses as Literature 10, with same prerequisites. Chief attention given to Milton, with more rapid study of Dryden, Pope, Burns, and other minor writers. A part of Course 2, but may be taken independently. Two hours credit.

13. Literature. Elective in all Engineering and Agricultural Courses. A short course including, so far as time permits, a survey of the principal forms of literature, limited of course, to the masters in each field. In the fall semester emphasis will be placed upon the Short Story and the Novel. Aim, to distinguish between what is and what is not excellent, by fixing in mind the qualities that contribute to greatness in these forms of literature. Method, rapid reading with attention directed to a few qualities, rather than minute detailed study. To give a broader outlook the reading done by the student will be supplemented by reports and lectures. Two hours credit.

14. Literature. Elective in all Engineering and Agricultural Courses. A continuation of Course 13, with emphasis on the Essay, the Drama, and Lyric Poetry. All work will be assigned with a view to appreciation through rapid reading, rather than by minute study. In the Drama will be included one or more plays from Shakespeare and also from present day dramatists. In the Essay, selections from such masters as Ruskin, Emerson, and Carlyle. In Lyric Poetry, selections from the most prominent poets of the 19th century. Two hours credit.

DEPARTMENT OF PUBLIC SPEAKING.

ARTHUR MAC MURRAY, PROFESSOR.
SYBIL M. LENTNER, ASSISTANT PROFESSOR.
FREDRICA V. SHATTUCK, INSTRUCTOR.
WINIFRED R. TILDEN, PHYSICAL DIRECTORESS.

The relation of the work of this department to the college course is the same as that of any other study. In some courses Public Speaking is elective, in some it is required; the credits are given on a basis with every other required or elective study. We aim to equip men and women to speak well, to tell what they know and give their opinions, to read and recite in a pleasing and effective manner. All will be called upon at some time to speak publicly, all talk every day, more or less, and for both the more formidable speech and for conversation the work of the department is planned. The subjects which make for perfection along these lines are briefly; emphasis, enunciation, articulation, time, energy, inflection, appreciation of literature, voice culture, gesture, vocabulary, etc., etc.

Public Speaking has been and still is considered often as a special, peculiar, and extraordinary art. There is no denying that it is an art, but first of all it is common sense; common sense applied to speech. The principles which govern conversation to make it dignified, pleasing and forceful may be called Elocution. The mastery of them would make the speaker artistic. These principles are not different when applied to public speech. Public speech is, therefore, conversation on an enlarged scale.

To reduce Public Speaking to a system is neither possible nor desirable. No one system can be made applicable to all persons, as no one style of clothing is appropriate to all classes and conditions of men. There are as many styles of elocution or systems of expression as there are people. Each one possesses an elocution of his own and that should not be taken from him and an inferior one for him be substituted. The development of that power and manner which one possesses already is our aim in the courses of study outlined below.

We grant that all so-called systems have good suggestions. We attempt to use the best of any and all methods, but the student himself is the system and he and his possibilities should be respected. The elimination of faults in speech which mar his efforts, and the correction of mannerisms that hinder his success are subjects of adverse criticism. To stan and think and talk well at one and the same time should be the ambitio of every student, man or woman, in his chosen occupation. The theor and practice of Expression,—and speech is more practice than theory,— covers four years of work to those who begin in the Academic year, thre years to those who begin as Freshman. However, not all the colleg courses grant electives in this department with credit, though none ar excluded if the proper consent is given.

Special Announcement of Courses in Extempore Speech.

The courses in Extempore Speech are designed to give students practical training in speaking without notes or without having written an committed to memory a formal address. There is a great demand fo men, who are well versed in the sciences and industries as offered in th several departments of the College, to address institutes, convention clubs and commissions on topics related to their chosen work. At gatherings formal and informal that person is in demand who can say the righ thing at the right time and in the right way. It is a worthy accomplish ıent to be able to speak well upon any occasion. For all such these ɔurses aim to prepare the student. They are in every way practical. The tudent from the very first is called to the floor to address his class on ssigned topics. He is given from three days to a week to gather his maerial and get it ready for his appearance before the class. As often as nce a week each individual is on the floor, oftener if possible. He is ubjected to criticisms by the class and the instructor. Criticisms are ffered on the prescribed lines of general appearance, force of address, rrangement of material, use of words, vocabulary, etc., etc. By subjecting imself to this severe scrutiny, and by the frequency of his addresses, the tudent gains an acquaintance with himself and a habit of thinking on his eet, which is real experience in speechmaking, second only to that which e would gain in appearing before outside audiences.

COURSES IN PUBLIC SPEAKING.

2. **The Declamation.** "A" semester in all Agricultural Courses and lective in General Science Course. This course is planned to help the tudent get command of himself. Attention is especially given to voice uilding and bodily expression. Besides this technical work, students are ssigned individual selection for practice and each is met for private ehearsal at regular intervals. One hour per week.

3. **Interpretation.** Elective in all Agricultural and Science Courses. 'his is a course in the study of methods of vocal interpretation, methods f criticism and methods of delivery. Of each student is required a epertoire, and beside the class lectures and class exercises on topics perıining to interpretation, each student is instructed privately and personally t stated intervals throughout the semester. Prerequisite, Course 2 or its quivalent. Two hours per week.

4. **Interpretative Analysis.** Elective all Agricultural and Science ourses. This course is a continuation of Course 3. Character study, ramatic and analytical interpretation are begun. Methods of analyzing, lipping and arranging stories and other literary forms complete the erm's work. Students are met for private rehearsals and criticisms as in receding courses. In this course class and public recitals are expected f the students. Prerequisites, Courses 2 and 3, or students may be adıitted to this course upon the recommendation of the instructor in charge. 'wo hours credit.

5. **The Lecture Recital.** Elective in all Agricultural and Science ourses. Option between Courses 5 and 10. It is a close study of draıatic recitations of all sorts, of the monologue, of the play and of the ecture-recital. Instruction is given by lectures and each student prepares ne long and strong program, either a monologue or a lecture-recital, for ıe semester. Prerequisites, Courses 2 and 3. Two hours credit.

6. **The Monologue.** Elective in all Agricultural and Science ourses. Option between 6 and 11. This course is a continuation of

Course 5. Advanced dramatics, plays, and lecture-recitals are studied and prepared. Prerequisites, Courses 2, 3, 4, or 5. Two hours credit.

7. **The Fine Art of Speech.** Elective in Science Courses. This is a course for women in the fine art of the spoken word. Though covering much the same ground as Course 10, it is designed particularly to suit the needs of women. The art of speech is compared with other arts; speech forms and values are studied and much time given to extempore speech-making in class. Two hours credit.

8. **Orations and Orators.** Sixth semester in the General Science Course and elective in all Agricultural Courses. This course is a study of prepared and formal address, such as orations and speeches for special occasions. Historical masterpieces and winning orations are studied, lectures are given on the technical structure of oratorical productions. At least one oration is required of each student during the semester. One hour credit.

9. **Oration.** Seventh semester General Science Course. Optional with Course 10. One oration is written under the personal direction of the head of the department. One hour credit.

10. **Extempore Speech.** Elective in all Agricultural Courses and the Science Course. Optional with Course 9 in the first semester of the senior year Science Course. The purpose of this course is to develop the power of extemporaneous speaking. Following a course of eight lectures relating to the fundamental principles of speech, the student begins his own practical work of extemporization. During this semester the principles of Argumentation are studied, and the assigned topics which the students develop in their speeches are argumentative in nature. Each member of the class is supposed to deliver from eight to fourteen extemporaneous addresses during the term, which gives him some considerable practice in practical speech-making. Open to Juniors and Seniors only. No prerequisite course. Two hours credit.

11. **Extempore Speech.** Elective in all Agricultural Courses and the Science Course. This course is a continuation of Course 10; the same methods are pursued in a more careful study of Exposition, Description, and Narration. After these three literary forms are studied we review the Argumentative form. The year's work is closed by requiring of each student, instead of an examination, a lecture of considerable length on an assigned topic. These two courses, 10 and 11, are made as practical as time and methods will admit. There is no course absolutely prerequisite to Course 11, although it is desirable to have the student elect Course 10 in the first semester. Two hours credit.

NOTE—Engineering students may elect any of the courses in public speaking by first getting the consent of the Dean of Engineering.

15. **D. E. Extempore Speech.** Seventh semester in the Domestic Economy Course. This course is for women only, and is designed to prepare them for extemporaneous demonstration work, and all sorts of speech-making before their classes, women's clubs, institutes, and other organizations before whom women are asked to appear in the discussion of

some topic of vital interest to the assembly. The purpose of the course is not different from the purpose of Courses 10 and 11. We intend in this course to help women to stand and think and talk well before any audience without manuscript or notes; neither are the addresses written and committed to memory. No prerequisite course. Two hours credit.

Special Work in Public Speaking.

Besides these specified courses of instruction in class, numerous special lessons and drills are given in the nature of coaching. Special selections are assigned based on the needs of the student as seen in his class-room work, and his defects and strengths are given special attention. Literary society declamatory and oratorical contest work is cared for by the teaching force of the department; such drill and preparation as each may need for his appearance in the contest are provided *gratis*.

PHYSICAL CULTURE FOR WOMEN.

Training in Physical Culture is required of the young women throughout the Freshman and Sophomore years. The work is given in two forty-five minute periods each week.

Before admission to the gymnasium classes, each student must be examined by the director with reference to physical development, strength of heart and lungs, and hereditary tendencies. These examinations with measurements are given at the beginning and close of each year's work. No student will be excused from the regular exercises except by order of the College physician.

The Swedish System of gymnastics, including marching tactics, calisthenics, and apparatus work, is taught. The highest ideals are kept constantly before the mind, not only health and strength, but ease, grace and refiniment in manner and carriage of the body.

Facilities for basket-ball, tennis, and field hockey are provided, and tramping squads are arranged for those who prefer this form of exercise. During the first six weeks in the Fall and the last six weeks in the Spring, the physical training will be out of doors and each student may choose which of the above mentioned sports she prefers. The regular gymnasium work begins the middle of October and continues until the middle of April.

Gymnasium suits of dark blue serge or flannel, regulation blouse and bloomers, and gymnasium shoes, are required.

COURSES IN PHYSICAL CULTURE.

1. **Marching Tactics.** First semester of all young women in College. Exercises for correct standing, walking, and breathing, marching tactics, figure marching. First term wand and games. Two hours per week. Fee, $1.00.

2. **Calisthenics.** Second semester of all young women in College. Calisthenics, marching tactics. Second term wands and dumb bells. Two hours per week. Fee, $1.00.

3. **Light Apparatus.** Third semester of all young women in College. Second term, dumb bells and Indian clubs. Light apparatus work. Two hours per week. Fee, $1.00.

4. **Swedish Gymnastics.** Fourth semester of all young women in College. Bar bells, apparatus work, stall bars, ladders, rings, etc. Fee, $1.00.

DEPARTMENT OF MODERN LANGUAGES.

LIZZIE MAY ALLIS, PROFESSOR.

MISS NORTON, MISS PETERS, MISS LOMMEN, MRS. FAIRFIELD, MRS. ARVILLE, AND MISS ZIMMERMAN, INSTRUCTORS.

MISS WENNHOLZ, STUDENT ASSISTANT.

The College now offers a three years' course in French, German, and Spanish.

COURSES IN MODERN LANGUAGES.

French.

1. **French.** "A" semester in all courses of those students who do not take German or Spanish, and elective first semester Junior or Senior year in all Agricultural and Science Courses. Fraser and Squair's French Grammar, Conversation and Dictation. Five hours credit.

2. **French.** "B" semester all courses for those students who do no take German or Spanish, elective second semester in Junior or Senior yea in all Agricultural and Science Courses.

Grammar continued. "Sans Famille," Malot. François French Pros Composition. Conversation and Dictation. Thorough course in irregula verbs. Prerequisite, Course 1. Five hours credit.

3. **French.** First semester General Science Course, elective in al Agricultural and Science Courses. Option between this, Course 7, an Course 32.

"Mon Oncle et Mon Curé," La Brète; "La Chute," Hugo. Prose Com position, Conversation, and Dictation. Prerequisite, Course 2. Five hour credit.

18. **French.** First semester Engineering Courses. Option betwee this, Course 20, and Course 36. Composition work and Scientific French Prerequisite, Course 2. Three hours credit.

19. **French.** Second semester Engineering Courses. Option betwee this, Course 21, and Course 37. Composition work and Scientific French Prerequisite, Course 18. Three hours credit.

50. **French.** Second semester General Science Course, elective Ag ricultural and Science Courses. Option between this, Course 26, and Cours 38. Tales of Maupassant and Zola. "Le Chevalier de Maison-Rouge, Dumas. Composition, Dictation, and Conversation. Prerequisite, Cours 3. Three hours per week

51. **French.** Third semester General Science Course. Option b tween this, Course 27, and Course 39. "La Belle Nivernaise," Daudet, "L

Bourgeois Gentilhomme," Molière; "Athalie," Racine. Prerequisite, Course 50. Three hours credit.

52. French. Fourth semester General Science Course. Option between this, Course 28, and Course 40. Selections from the French Poets. Composition, Conversation. Prerequisite, Course 51. Three hours per week.

54. French. Second semester General Science Course. Option between this, Course 72, and Course 44. "La Mare au Diable," George Sand. French Composition, Conversation, Dictation. Prerequisite, Course 1. Three hours credit.

55. French. Third semester General Science Course. Option between this, Course 71, and Course 43. French Literature or Scientific French. Prerequisite, Course 54. Three hours per week.

56. French. Fourth semester General Science Course. Option between this, Course 72, and Course 44. French Literature or Scientific French. Prerequisite, Course 55. Three hours per week.

57. French. First semester Engineering Courses of those students who have presented for admission four credits in Latin. Three hours credit.

58. French. Second semester Engineering Courses of those students who have presented for admission four credits in Latin. Three hours credit.

German.

5. German. "A" semester all courses, elective Agricultural and Science Courses. Option between this, Course 1, and Course 30. "German Lesson Grammar," Joynes and Wesselhoeft. Grammar, composition, reading and conversation. Five hours credit.

6. German. "B" semester in all courses, elective Agricultural and Science Courses. Option between this, Course 2, and Course 31. Continued drill in the principles of declension, conjugation and syntax. "German Lesson Grammar," Joynes and Wesselhoeft. "Immensee," Storm. Prerequisite, Course 5. Five hours credit.

7. German. First semester General Science Course, elective Agricultural and Science Courses. Option between this, Course 3, and Course 32. "Höher als die Kirche," Hillern, and "Willkommen in Deutschland," Mosher. Prerequisite, Course 6. Five hours per week.

20. German. First semester Engineering Courses. Option between this, Course 18, and Course 36. German prose, narrative. Prerequisite, Course 6. Three hours credit.

21. German. Required second semester Freshman year in all four year Engineering Courses. Option between this, Course 19, and Course 37. "Scientific German," Hodges. Prerequisite, Course 20. Three hours per week.

26. German. Second semester General Science Course, elective Agricultural and Science Courses. Option between this, Course 50, and

Course 38. "Wilhelm Tell," Schiller. Conversation and study of Syntax. Prerequisite, Course 7. Three hours per week.

27. **German.** Third semester Science Courses. Option between this, Course 51, and Course 39. "Maria Stuart," Schiller. "Elements of German Conversation," Vos. Prerequisite, Course 26. Three hours per week.

28. **German.** Fourth semester General Science Course. Option between this, Course 52, and Course 40. "Nathan der Weise," Lessing, or "Hermann und Dorothea," Goethe. Prerequisite, Course 27. Three hours per week.

29. **German.** Second semester General Science Course. Option between this, Course 54, and Course 42. German Literature or Scientific German. Prerequisite, Course 5. Three hours per week.

71. **German.** Third semester General Science Course. Option between this, Course 55, and Course 43. German Literature, Scientific German. Prerequisite, Course 29. Three hours per week.

72. **German.** Fourth semester General Science Course. Option between this, Course 56, and Course 44. German Literature, Scientific German. Prerequisite, Course 71. Three hours per week.

73. **German.** First semester Engineering Courses, of those students who have presented for admission four credits in Latin. Three hours credit.

74. **German.** Second semester Engineering Courses, of those students who have presented for admission four credits in Latin. Three hours credit.

Spanish.

30. **Spanish.** "A" semester all courses, elective Agricultural and Science Courses. Option between this, Course 1, and Course 5. "First Spanish Book and Reader," Giese. "Método Berlitz," Exercise, Dictation, Conversation. Five hours per week.

31. **Spanish.** "B" semester all courses, elective Agricultural and Science Courses. Option between this, Course 2, and Course 6. Giese's Reader and "Método Berlitz," continued. Prerequisite, Course 30. Five hours per week.

32. **Spanish.** First semester General Science Course, elective Agricultural and Science Courses. Option between this, Course 3, and Course 7. Alarcon's "El Capitan Veneno." Review of Grammar with Exercises. Prerequisite, Course 31. Five hours per week.

36. **Spanish.** First semester Engineering Courses. Option between this, Course 18, and Course 20. "Zaragüeta," Carrion and Aza; "Introduccion al Estudio de las Ciencias," from "Cartillas Cientificas." Prerequisite, Course 31. Three hours per week.

37. **Spanish.** Second semester Engineering Courses. Option between this, Course 19, and Course 21. Books selected from "Cartillas Cientificas." Prerequisite, Course 36. Three hours per week.

38. Spanish. Second semester General Science Course, elective Agricultural and Science Courses. Option between this, Course 50, and Course 26. "Doña Perfecta," Galdós. Prerequisite, Course 32. Three hours per week.

39. Spanish. Third semester General Science Course. Option between this, Course 51, and Course 27. "Pedro Sanchez," Pereda. Prerequisite, Course 38. Three hours per week.

40. Spanish. Fourth semester General Science Course. Option between this, Course 52, and Course 28. "El Comendador Mendoza," Valera. Prerequisite, Course 39. Three hours credit.

42. Spanish. Second semester General Science Course. Option betwwen this, Course 54, and Course 29. Spanish Literature or Scientific Spanish. Prerequisite, Course 30. Three hours per week.

43. Spanish. Third semester General Science Course. Option between this, Course 55, and Course 71. Spanish Literature or Scientific Spanish. Prerequisite, Course 42. Three hours per week.

44. Spanish. Fourth semester General Science Course. Option between this, Course 56, and Course 72. Spanish Literature or Scientific Spanish. Prerequisite, Course 43. Three hours per week.

45. Spanish. First semester Engineering Courses, of those students who have presented for admission four credits in Latin. Three hours credit.

46. Spanish. Second semester Engineering Courses of those students who have presented for admission four credits in Latin. Three hours credit.

DEPARTMENT OF HISTORY.

ORANGE HOWARD CESSNA, PROFESSOR.
LOUIS BERNARD SCHMIDT, ASSISTANT PROFESSOR.
MISS ETHYL CESSNA AND MISS CARRIE WATTERS, INSTRUCTORS.

COURSES IN HISTORY.

1. English History. Required for entrance to all Academic Courses unless satisfactory credits are presented. This course treats of the political, constitutional, religious, social and economic features in the development of Great Britain. Special attention is given to those influences which have affected American history. Text-book, library and written work. Prerequisite, one year of general history. Five hours credit.

2. Advanced American History. "B" semester Science Courses. Presupposing an outline knowledge of European and American history, this course aims to give a maturer and more comprehensive view of American development. It corresponds to the American history offered in last year in accredited high schools. Text-books, lectures and assignments. Four hours per week.

3. **The West in American History.** Elective in all Science and Agricultural Courses. This course treats of the history of the settlement and development of the west, with special reference to the Mississippi Valley. Emphasis is put on social, economic and political conditions. It deals with the westward movements, the growth of new institutions, the bearing of new problems upon the interpretation of the constitution and economic and social forces in their influence upon the growth of democracy. Text-book, lectures and research work. Three hours per week.

4. **Division and Reunion, 1850 to 1876.** Fourth semester Science and Agricultural Courses, elective in all Agricultural and Science Courses. Conditions preceding the Civil War, the causes, principal features and results of the struggle; the Reconstruction period; the political, social, and economic movements and foreign relations of America as it faces the problems of the present. Text-book, lectures and research work. Three hours per week.

5. **Europe in the XVIth, XVIIth and XVIIIth Centuries.** Second semester General Science Course, elective in Agricultural and Science Courses. A study of historical development, the Reformation, struggle for constitutional liberty in England, ascendency of France, rise o1 Prussia and Russia, England's Colonial supremacy, also social, economic and literary questions. Lectures and library work. Three hours per week.

6. **French Revolution and XIXth Century.** Required as an optional with Economics 10, in the fourth semester in Horticulture and Forestry and Dairying Courses. Elective in the first semester of Sophomore year in the General Science Course, elective in all Agricultural Courses. Causes and results of the French Revolution, the Napoleonic era, reactions and revolutions of the XIXth Century to the close of the Franco-Prussian war; also institutional changes touching the political, social and economic aspects of the movement. Text-books, library, and lecture work. Three hours per week.

7. **America in the Far East.** Elective in Engineering Courses. This course is a study of some of the later phases of American development, especially as it has come into touch with the Far East. Lectures and library work. Two hours per week.

9. **Some Later Phases of the Far Eastern Question.** Elective in the Engineering, Agricultural and Science Courses. This course is a study of some of the later developments in the Far East, dealing especially with the New China and the New Japan since the Russo-Japanese War, showing America's new interest in the Far East. Lectures and library work. Two hours per week.

10. **The Renaissance.** Elective in all Science and Agricultural Courses. A general survey of the renaissance period followed by a somewhat detailed exposition of economic, political, intellectual and artistic progress with a criticism of the importance attached to the influence

of revived antiquity. Includes a history of the movement in Italy and in the northern countries, and a consideration of the agencies and events which ushered in the modern age. Text-books, lectures and assignments. Two hours per week.

11. Constitutional History of England. Elective in Science and Agricultural Courses. Study of origin and development of the English constitution and political institutions, and their influence upon the American political system. Text-book, lectures and examination of documents. Recitations, two hours per week.

12. Diplomatic History of the United States, 1775-1829. Elective in the Science and Agricultural Courses. A study of the diplomatic negotiations and treaties between the United States and foreign powers. Special attention will be given to the formation of the French alliance, treaty of 1783, early commercial treaties, complications arising out of the Napoleonic wars, purchase of Louisiana, Barbary powers, Treaty of Ghent, acquisition of the Floridas, the Monroe Doctrine and the Panama Congress. The progress of international law so far as it has been affected by the United States in these controversies will also be considered. Text-book, lectures and library work. Two hours per week.

16. The National Period. "B" semester of all Agricultural and Engineering Courses. Presupposing an outline knowledge of European and American history, this course aims to give a maturer and more comprehensive view of American development from 1789 to the present. Text-book, lectures and assignments. Three hours credit.

17. The American People. First semester Agricultural Engineering Course, third or fifth semester in all Engineering Courses. This course give an outline view of the expansion of the American people. Special emphasis is given to the social and territorial features in this development, with special reference to the part played by the people in the making of the American nation. Lecture, text-book and library work. One hour per week.

18. American Statesmen. Fourth or sixth semester in all Engineering Courses, and seventh semester Agricultural Engineering Course. This course treats of the work of the leading statesmen in the formation and growth of the American nation. The different movements in the political evolution of a nation become embodied in great men. While emphasis is placed on movements rather than on biographical details, yet it is recognized that these movements become vitally expressed in personality. Lecture, text-book and library work. One hour per week.

19. The Making of the Nation, 1783-1817. First semester all Agricultural Courses except Agricultural Engineering. This course treats of the formation of the American Union. It includes a preliminary survey of the Revolutionary period; a study of the critical period; the formation and adoption of the constitution; the inauguration of the new government; early national problems, and the formation of policies and political parties. Lectures, text-books and library work. Two hours a week.

20. History of Education. Elective Agricultural and Science Courses. This course, after a general survey of the history of education during the earlier periods, gives careful consideration to Hebrew, Greek and Roman education; continuing with a briefer survey of education during the middle ages, it deals more fully with the renaissance and reformation periods, also the realistic movements under Erasmus, Montaigne and Comenius. Monroe's History of Education is used as a text, supplemented by lectures and class reports. Two hours per week.

21. History of Education (Continued). Elective Agricultural and Science Courses. This course is a continuation of History 20, and treats of the disciplinary conception of education under Locke; the naturalistic tendency under Rousseau; the psychological tendency under Pestalozzi, Herbart and Froebel; the scientific tendency of Spencer and Huxley; the later sociological tendency, and closing with a consideration of the present eclectic movements. Monroe's History of Education is used as a text, supplemented by lectures and class reports. Two hours per week.

DEPARTMENT OF CIVICS.

RICHARD CORNELIUS BARRETT, PROFESSOR.

Civics as herein used means the science that treats of citizenship and of the relations between citizens and the government; ethics, or the doctrines of duty to society; civil policy, or governmental methods and machinery; law, in its application most directly involving the interests of society; history of civic development and movement, and the structure and working of the government and the interrelation of states.

While it is planned to give instruction concerning the American government as it now exists, the student will be expected to look forward to the solution of such problems as may confront the people and the government. At the same time such definite and fixed historical information will be expected from each student as will enable him to have a clear understanding of present governmental forms and practices.

No system of human government is perfect. The discussion of defective laws and the non-enforcement of present laws are common topics of conversation in every state.

Believing that in a republic where the people are supreme, an education is incomplete, if not a failure, that does not relate itself to the duties and opportunities of citizenship it will be a purpose to point out to the student a reasonable and patriotic duty touching present laws, and to aid him in all possible ways to become a useful, honored, and law abiding member of the civic community, and to give him suitable instruction with regard to public affairs.

The courses are planned to give such knowledge and training as it is believed should be a part of a liberal education.

The courses offered in Civics are more or less closely interrelated with those given in the Departments of History, and Economic Science, but it is believed that the association will prove in every way helpful to the student.

COURSES IN CIVICS.

1. **Government in State and Nation.** "A" semester Engineering Courses. Includes study of city, county, and state governments; constitutional conventions; constitutions as "Supreme Law;" checks and balances; the presidency, senate, and house of representatives; general powers of congress; judicial system, federal and state; division of power; comparison with other federal governments; spoils system and civil service; and government of territories and colonies. Text-book, supplemented by papers and library work. Recitations, two hours per week.

2. **Principles of American Government.** Elective Science Courses. Includes study of Magna Charta, Act of Habeas Corpus, Petition of Rights, Bill of Rights, Declaration of Independence, Articles of Confederation, First State Constitutions, Constitution of the United States, American Party System, and relation between Federal and State Governments. Prerequisite, Course 1 or its equivalent. Individual investigations and library work. Recitations, three hours per week.

3. **State and Federal Constitutions.** Elective Science Courses. Includes study of the rise of American Union; distribution of powers of government; the powers of Congress, the legislature, and federal and state executive; the judicial department of state and federal government; government of the territories; admission of new states; civil rights and their guaranties; political privileges and their protections; protection of persons accused of crime; contract and property; eminent domain; and municipal corporations. Prerequisite, Course 2. Text-book, supplemented by lectures, papers and library work. Recitations, three hours per week.

4. **Citizenship.** Elective Science Courses. Includes study of the family and its government; conditions of good citizenship; rights and duties of citizens; citizen's duty to government; abuses and perils of government; improvement of government; economic duties of citizens; social rights and duties; great social subjects; treatment of criminals, paupers and incorrigible children; international duties, or the rights and duties of nations; ideals, or the higher law. Prerequisites, Courses 2 and 3. Recitations, two hours per week.

5. **Rural Law.** Elective Agricultural Courses. A study of Iowa laws as related to highways, fences, weeds, water rights, ditching, drainage, live stock, trespassing; also the legal rights, duties and responsibilities of farmers; also contracts, negotiable instruments, sales and personal property. Recitation, one hour per week.

6. **Actual Government.** Elective Science Course. A study of governmental systems, including state government and various phases of

local government; the Constitution and Statutes as framework of the government and as dependent upon personal interest and action; also working experience of constitution and laws. Considerable attention is given to current events. A more extended course than 9 covering more completely both the organization and functions of government. Recitations, three hours per week.

7. **Comparative Government.** Elective Engineering Courses. A comparative study of the governments of England, France, Germany, Switzerland, Canada, Mexico and the United States. Also principles of constitutional and international law. Recitations, lectures or papers, two hours per week.

8. **Government in State and Nation.** "A" semester Science Courses. Includes study of city, county, and state governments; exercise of police power, and penal and charitable institutions; constitutional conventions; constitutions as "Supreme Law;" checks and balances; the Presidency, Senate and House of Representatives; general powers of Congress; judicial system, federal and state; division of power; comparison with other federal governments; spoils system and civil service; and government of territories and colonies. A more extended and thorough course than 1. Text-book, supplemented by papers and library work. Recitations, three hours per week. The 1908-9 students will pursue Course 2.

9. **Actual Government.** Elective Domestic Economy Course. A study of governmental systems, including state government and various phases of local government; the Constitution and Statutes as framework of the government and as dependent upon personal interest and action; also working experience of constitution and laws. Considerable attention is given to current events. Recitations, two hours per week.

10. **Municipal Government.** Elective all Courses. A careful study of European and American cities; their relation to the central government, their organization and administration; the "commission" plan of city government; functions of the various departements of city government; municipal problems such as those relating to pure government, etc. Prerequisite, Civics 3. Two hours credit.

11. **School Supervision.** Elective all Courses. This course embraces the chief principles and practical problems of school organization and administration; functions of school boards, superintendents and principals; supervision of class work, teachers' meetings, etc. Two hours credit.

12. **Educational Legislation, School Management and Administration.** Elective all Courses. Modern tendencies in educational legislation; school funds, taxation, compulsory education, child labor, examination and certificate of teachers, consolidation and centralization of schools, medical inspection of schools, free text-books, class room management, etc. Prerequisite, Course 11. Two hours credit.

DEPARTMENT OF MILITARY SCIENCE AND TACTICS.

GENERAL JAMES RUSH LINCOLN, PROFESSOR.

It is not intended to complete the education of the thorough soldier, but to fit young men for filling intelligently, positions in the State troops as line officers and company instructors. The constant demand for men thus trained emphasizes the value of a thoroughly organized and well sustained military course. The chief advantages derived are the acquirement of a dignified carriage of person, a gentlemanly deportment and a self respecting discipline, with habits of neatness, order and punctuality. Opportunities are offered each cadet for extending the studies in military science, as desired, the College being provided with the necessary arms, accoutrements and outfits for drill and instructions in the infantry, artillery, and signal tactics, for which special classes will be formed. Lectures on military subjects are delivered throughout the course and regular battalion drill and parade take place each Monday and Wednesday afternoon.

All male students of the Freshman and Sophomore years, except such as may be excused on account of physical disability by proper authority, are required to become members of the College Battalion, and wear the prescribed military uniform during military exercises.

COURSES IN MILITARY SCIENCE AND TACTICS.

1. First semester Agricultural, Veterinary, Engineering and Science Courses. Two drills per week.
2. Second semester Agricultural, Veterinary, Engineering and Science Courses. Two drills per week.
3. Third semester Agricultural, Veterinary, Engineering and Science Courses unless regularly classified in Physical Training. Two drills per week, also the Non-Commissioned Officers' School of one hour per week, the School of the Guides and Guard Duty, required of all officers.
4. Fourth semester Agricultural, Veterinary, Engineering and Science Courses unless regularly classified in Physical Training. Two drills per week, also the Non-Commissioned Officers' School of one hour per week. Drill regulations and Guard Duty, required of all officers.
5. **Elective** in Agricultural, Veterinary, Engineering and Science Courses. Two drills and Officers' School of one hour per week. Drill Regulations, Guard Duty, and Army Regulations.
6. **Elective** in Agricultural, Veterinary, Engineering and Science Courses. Continuation of Course 5.
7. **Elective** in Agricultural, Veterinary, Engineering and Science Courses. Two drills and Officers' School of one hour per week; Service of security and information, Military Engineering, Military Law and Military Hygiene.
8. **Elective** in Agricultural, Veterinary, Engineering and Science Courses. Continuation of Course 7.

THE LIBRARY.

MISS VINA ELETHE CLARK, LIBRARIAN.
MISS CAROLYN GRIMSBY, REFERENCE LIBRARIAN.
MISS MARGARET FORGEUS, CATALOGUER.
MISS CAROLINE E. LAIRD, ASSISTANT LIBRARIAN, ENGINEERING LIBRARY.
MISS VERA M. DIXON, ASSISTANT LIBRARIAN, GENERAL LIBRARY.
J. F. BOOTH, STUDENT ASSISTANT IN ENGINEERING LIBRARY.
S. W. ALLEN, STUDENT ASSISTANT IN GENERAL LIBRARY.

The College Library, consisting of over 23,000 volumes and 6,000 pamphlets, is chiefly a library of reference containing standard and technical works bearing particularly upon the lines of work pursued in the College. These include standard works of history, biography, engineering, agriculture, natural sciences, mental and moral philosophy, poetry, general literature and reference. The books are selected with great care, the heads of the departments indicating such works as they wish the library to have bearing upon their respective lines of work.

This year the College received by bequest about 1,500 volumes pertaining to Engineering and Economics from the library of the late Geo. W. Catt. This Engineering Library with that section of books from the general collection has been made a Departmental Library located in Engineering Hall.

The library is classified according to the Dewey Decimal System of Classification and the card catalogue is in two parts, the Dictionary (author and title) and Classed.

The library has on file 6,000 unbound pamphlets, and is in constant receipt of large numbers of publications from the various departments of the government, agricultural experiment stations and other sources. The library has also several hundred bound volumes of government publications, such as Geological Surveys, United States Experiment Station Bulletins, Congressional Record, Census Reports and Cabinet Officers' Reports.

The library receives about 250 periodical publications, literary, scientific and general, and there are complete files of many of these upon the shelves.

The library subscribes for several dailies and, through the courtesy of the editors, a large number of the daily and country newspapers of Iowa are sent to the reading room for the use of students.

The reading room of the library is open to readers thirteen hours daily, except Sundays, when it is open four hours. Current numbers of periodicals are kept in the reading room and are accessible to all, as are newspapers, college exchanges, dictionaries, encyclopedias, Poole's Index, the card catalogue, etc.

Personal assistance and suggestions upon all matters relating to the library will be given by the librarian and assistants to all who desire such help.

COURSE IN LIBRARY WORK.

1. Library Work. First semester in Agronomy, Dairy, Animal Husbandry, Horticultural, Science and Agriculture and General Science Courses. Four hours per semester.

DEPARTMENT OF MUSIC.

ALEXANDER STEWART THOMPSON.
Director.
Piano, Pipe Organ, Voice and Theory.
CLARA DUTTON THOMPSON,
Vice Director.
Voice, Preparatory Piano and Organ.
GEORGINE VAN AUKEN,
Violin and Stringed Instruments.
CHARLES L. MUNDHENK,
Brass Instruments.

Ames Conservatory of Music was established as a department of the College. It is essentially a school of musical learning. It stands for high ideals and strives by means of thorough training to develop to the highest stage of artistic capability all those possessing musical talent.

No Requirements Necessary for Admission.

As the work in the Conservatory is largely private instruction, there are no special requirements for admission, but it is always desirable to bring a musical selection well prepared to perform before the Director, or before the teacher at the first lesson. In this way only can a satisfactory opinion be formed as to the student's ability, grade of advancement, or character of the previous study.

All grades of instruction are given from the very beginning to the most advanced ideas in interpretation.

Complete Courses.

In Pianoforte, Pipe Organ, Voice, Harmony, Counterpoint, Canon, Fugue, Analytical Harmony and Form, Composition and Musical History.

Other Courses Offered.

Ensemble Music, Sight Reading, Chorus Singing, Choir and Band Practice.

Free Privileges.

All of the recitals by students and the recitals and lectures given by the instructors are free to all of the music students, also practice in the college choir. The music students in common with all of the college students have many opportunities of hearing distinguished speakers on the college platform, which opportunities conduce largely to the mental culture and development of the earnest student. A large state institution like Iowa State College offers much more advantage in the hearing of great speakers than the smaller institutions.

The Literary Societies of the College are open to students of the Conservatory.

Artists' Course.

From time to time great musical artists will be heard at the College. For these entertainments a charge will be made, and all musical students are expected to attend.

Choral Society Concerts.

At least two concerts will be given during the year by the Choral Society on which occasions the Society will be assisted by celebrated musical artists from abroad.

Such works as Barnby's Rebekah, Gaul's Holy City, Buck's Forty-Sixth Psalm, Coleridge Taylor's Hiawatha's Wedding Feast. Cowen's Rose Maiden. A. S. Thompson's Lazarus have been successfully given in concert. Such artists as Madame Isabelle Bouton of New York have sung with the Choral Society.

An excellent Male Glee Club gives concerts each semester. Membership in this organization is gained by examination.

Requirements for Graduation.

The candidate for a certificate from the College for the completion of any course in music shall possess an English education equivalent to admittance to the Freshman year of the College in the Science Courses.

Diplomas will be awarded pupils who have completed the prescribed course, which in all specialties whether piano, voice, or organ, includes the thorough study of harmony and musical theory and a knowledge of musical history. No diplomas will be issued excepting under above conditions, but students who are unable to remain long enough to complete the full course will be given a certificate on conditions outlined below.

The granting of an Artist's Diploma is partially dependent upon the ability to render compositions in a finished and artistic manner. Quality of performance is a decisive factor in the award of this diploma.

Those who wish to enter upon a regular course leading to graduation should make application to the Director after finishing the second term in Harmony.

Vocal Music.

Candidates for the teacher's certificate in vocal music, in addition to the above general requirements, must have satisfactorily completed the three years' course in vocal music and must possess the ability to perform acceptably selections from the standard oratorios and operas. They must also have completed one year each of the modern languages—French and German, one year of Sight Singing, and two years of Harmony.

Candidates for the artists's diploma must have completed the four years' course in vocal music, besides the general requirements, which include a two year's course in Harmony, and one year of Sight Singing.

Piano.

Candidates for the teacher's certificate in piano, in addition to the general requirements, must have satisfactorily completed the three year course outlined below, including compositions covering the classical and romantic periods and also the lighter works of some modern composers. They must also have satisfactorily completed the course in musical history, in ensemble playing, and the full theoretical course.

Candidates for the artist's diploma in piano, in addition to the work required for a teacher's certificate, must have completed the four years' course in piano. Particular emphasis is placed upon the graduation recital for students in the piano course.

Pipe Organ.

Candidates for graduation in this course must have completed the prescribed work on organ, the course in musical history, the full theoretical course and be able to accompany a choir, chorus, or soloists in a satisfactory manner.

COURSES OF STUDY.

THEORY.

Harmony. Four Terms.

Text-book—Goetschius, The Material used in Musical Composition.

Keys, scales, and signatures; intervals, the triads, chord connection, simple part writing, and keyboard work.

Harmonizing basses, inversions, chords of the sixth, keyboard work, and ear training.

Chords of the seventh and their inversions. Modulation begun.

Chords of the seventh and their inversions continued.

Chords of the ninth. Altered and augmented chords.

Suspensions, Retardations, and Organ Point.

The harmonization of melodies begun. Modulation continued and completed.

Counterpoint. Two Terms.

Text-books—Dr. Frederick Bridge and Dr. Francis E. Gladstone on Counterpoint.

Single Counterpoint in two parts. One, two, three, and four notes against one; syncopation and retardation.

Single Counterpart in all forms in three and four voices.

Canon and Fugue.

Text-book—Richter Double Counterpoint and Fugue, Higgs on Fugue.

Analytical Harmony.

Open to students who have completed course in Harmony.

Study of harmonic structures and general study of musical form.

Composition and Instrumentation.

Study of form and composition and the instruments of the orchestra, etc.

Sight-Singing.

Beginning Class—The work will embrace a thorough explanation of all the fundamental principles of music—notes, time, keys, major scales, intervals, arpeggios, common chords and chromatics. Special work in ear training.

Advanced Class.—The work will embrace the study of minor and chromatic scales, dominant and diminished seventh chords. Mordent, trill, appoggiatura, acciaccatura. Ear-training. Sight reading will be the great feature; and all who may understand the principle of reading at sight, yet do not have a practical knowledge thereof, will find the glees, anthems, part songs, etc., very interesting.

Voice.

The aim of this course is to develop, through deep breathing properly applied to voice placement, that full, resonant tone which has always characterized the artists trained in the Italian school, to attain a clear enunciation, a keener appreciation of the subtler meanings of the verbal text and an understanding of the foundational principles underlying all musical interpretation to the end that the singing may be distinguished by musicianly, scholarly qualities and deep, human sympathy.

Preparatory Course.

Breathing and voice placing exercises; sustained tones and scale work according to the Italian method as taught by Sims Reeves of London, England, and Vannucini of Florence, Italy. Concone's Fifty Lessons; Concone's Forty Lessons for Bass; Marchesi's Exercises, Op. 1, First Part; Vaccai's Studies.

College Course.

First Year. Voice placing exercises; scales, sustained notes, and articulation exercises; Marchesi's Studies; Concone's Twenty-five Lessons; songs by American composers, Denza, Cowen, Gastaldon, Jensen, Grieg, and Mendelssohn.

Second Year. Voice placing exercises continued; scales, etc., Marchesi's Studies; Concone's Fifteen Lessons; songs or solos by Schubert, Schumann, Grieg, Handel, or other good foreign and American composers.

Third Year. Voice placing exercises continued; Marchesi's and Bordogni's exercises; solos from the standard oratorios and operas, Sullivan, Mendelssohn, Handel, Mozart, and some of the Italian composers.

Fourth Year. Review of Handelian arias; Beethoven, Wolf, Strauss, Brahms, and Franz songs; Wagnerian, and other opera solos.

Piano.

The course in this department is intended to meet the varying needs of individual pupils, with the idea of furnishing a comprehensive, rather than a rigid, inelastic training in piano-forte technic. While the acquirement of finger dexterity is necessary, the value and importance of the mental training to be obtained from the study of music is emphasized and the course is expected to make apparent the advantage of a broad musical education.

Preparatory Course.

The Preparatory Course is sufficiently simple to include beginners, and requires the study of the following exercises: Stephen Emory's Foundation Studies; Herz Scales; Handrock's Mechanical Studies; Enckhausen Progressive Melodious Studies, four books; Ehmant Petite Ecole Melodique, four books; Mathew's Graded Course, first four books.

The major and minor scales and major and minor chords must be played from memory, besides a variety of musical figures suggested by the various composition. These points are brought out by the use of works by Kohler, Duvernoy, Burgmuller, Gurlitt, and Schumann's studies for young students.

These fundamentals must be fully mastered before a pupil can be classified as a student in the Collegiate Musical Course. The mastery of these principles is of the greatest importance, as it is the only way to secure intelligent and sure progress in the advanced stages. No efforts will be spared to induce the student to work with that personal relish so necessary to good work.

College Course.

First Year. Major and minor scales and arpeggios.

Mathew's Graded Course, Books 5 and 6; Mason's Technics; Beren's New School of Velocity, Books 1 and 2; Selections from Clementi and Kuhlau Sonatinas; Pieces by Bohm, Thome, Godard, Lebierre, Sapelnikoff; suitable novelties American or foreign.

Second Year. Scales and Double Thirds, etc.

Mathew's Graded Course, Book 7; Mason's Technics; Beren's New School of Velocity, Books 3 and 4; Low's Octave Studies; Selections from Haydn and Mozart Sonatas; Selections from Mendelssohn's Songs Without Words; Easier pieces of Chopin, also pieces by modern authors Chaminade, Rachmaninoff.

Third Year. Scales, etc.

Mathew's Graded Course, Books 8 and 9; Cramer's Etudes, Mason's Technics; Kullack's Octave Studies; Beethoven Sonatas; Compositions by Chopin, Schumann, Grieg, and other standard authors.

Fourth Year. Scales, etc.

Mathew's Graded Course, Book 10, or its equivalent; Chopin's Etudes; Beethoven Sonatas; Schumann's Symphonic Etudes, and Liszt's Compositions.

Pipe Organ.

In this course it is desirable that a student should have had a thorough course in piano finger technic, and have taken at least a year of Harmony as a prerequisite. As natural adaptation for the organ plays a great part in the student's progress on organ an outline only of the work is given.

The course comprises simple exercises for developing correctness and fluency in pedal playing; Thayer's Pedal Studies, together with easy preludes, chorals and trios, for cultivation of independence in manual and pedal; the easier works of Bach, Mendelssohn, Merkel and others.

Volckmar's Pedal Studies; Buck's Studies in Pedal Phrasing; Sonatas from Mendelssohn, Rheinberger, Ritter, and Bach.

The works of the modern French school form a large part of the repertoire taught in this course.

SUPERVISOR MUSIC COURSE.

This course is designed for those students who are desirous of making a specialty of teaching music in the public schools. A thorough mastery of singing by syllable is one of the great objects to be attained in conjunction with as thorough cultivation of the voice as the time will permit. In the second semester methods and study of the child voice will be taken up. Musical History and Harmony are continued throughout the year.

In order that those taking this course should be useful in the school system it was deemed advisable to include a drawing course that would enable one to teach that branch in public school, if necessary. On the completion of the course a certificate will be issued.

MUSIC COURSE. ONE YEAR.

Prerequisites.

Graduation from an accredited high school or its equivalent. Ability to play piano, fourth grade, with a full knowledge of the major and minor scales.

Voice Culture. Two semesters. Two private lessons a week.

Harmony. Two semesters. Two class lessons a week.

Sight Singing. Two semesters. One hour a week.

Musical History. Two semesters. Two class lessons a week.

Methods of Public School Music Teaching and Study of the Child Voice. One semester. Second semester. One hour a week.

Tuition for this course: First semester, $42.00; second semester, $58.00.

DRAWING COURSE.

Special course in Drawing, arranged for students taking music.

1. **Mechanical Engineering 19.** A course in isometric drawing and linear perspective. One hour credit. Four hours drawing per week.
2. **Mechanical Engineering 121.** A course in mechanical drawing. Practice in the use of drawing instruments, lettering and making working drawings. Two hours credit. Six hours drawing per week.
3. **Mechanical Engineering 322.** Mechanical Drawing. Sketching and detailing of machine parts and architectural subjects. One hour credit. Three hours drawing per week. If desired, can be extended to two hours credit, six hours drawing per week.
4. **Mechanical Engineering 423.** Mechanical Drawing. A continuation of Course 322. Making of working drawings, tracings, and blue prints. Two hours credit. Six hours drawing per week.

Drawing periods are usually for three consecutive hours. Students should not classify for less than two consecutive hours in one period.

History of Music.

General history, development and influence of music among ancient peoples. Early Christian music. Polyphonic music.

Various schools of polyphonic music. The rise of dramatic and instrumental music, and the development of the various musical instruments.

The development of the Opera and Oratorio. The Romanticists. Modern music and musicians.

The above course can readily be accomplished in one year with two recitations a week. As the general object of the study is cultural, College students not pursuing music specially would be greatly benefited in a cultural sense by the pursuit of this study.

Interpretation Classes.

The study of harmony is a prerequisite to entrance into this class.

The principal idea in the work of the classes in Interpretation is "How to make music interesting." The work of this class is under the personal instruction of the Director, and all students in all departments are urged to broaden their musical horizon by attending for at least a few terms. Different composers, different instruments, tradition in song, the Rubato, and contrasts in tone color will be some of the subjects discussed. Many compositions will be performed by both students and teacher, and the culture here derived will be of the most practical sort.

Violin.

The aim in this course is to develop players of fine quality and to develop executive and interpretive power in the highest degree.

PREPARATORY COURSE.

Franz Wolfart, Book 1.

Violin Method for Beginners, O. Ševčik, Parts I, VI, VII. Easy pieces.

COLLEGE COURSE.

First Year. Preparatory Method of Violin Technics, O. Ševčik. Books I and II. Changes of Position and Preparatory Scale Studies. Prep. Studies in Double Stopping in Thirds, Sixths, Octaves, and Tenths. Pieces by DeBreriot and others.

Second Year. Etudes by Kreutzer, Fiorillo and Rode. Concertos by Mozart, Wieniawski, and pieces by classic and modern composers.

Third Year. School of Violin Technics for Advanced Pupils, O. Ševčik, Books I, II, III, and IV; Exercises in Double Stopping, Triple and Quadruple Stopping, Pizzicato, Flageolet-tones. Solos from Wieniawski, Ernst, and Vieuxtemps.

Fourth Year. 40 Variations, O. Ševčik. Bow technics. Preludes Campagnoli, Caprices Paganini. Concerts from Paganini, Mendelssohn, Beethoven, Bruch, Saint Saens, etc.

BAND INSTRUMENTS.

Instruction is given in these instruments by Charles L. Mundhenk, the director of the College Band.

Regulations

Students must register and secure entrance cards (each semester) before they begin their lessons. A student may register at the beginning of the semester or for the unexpired portion thereof. The entrance card must be presented to the instructor at the first lesson.

All tuition is payable at time of registration. No deviation from this rule will be permitted unless the pupil, parent, or guardian makes application to the Director for an extension of time.

Students may enter at any time. Students may enroll for music alone without additional expense.

No pupil will be allowed to register at the regular semester rates for less than a full semester. Pupils taking less than a full semester will pay for their lessons at the following rates: Half-hour private lessons with Alexander S. Thompson, $1.25. Class lessons in Harmony, etc., 75 cents. Half-hour private lessons with Mrs. Thompson, $1.25. Preparatory Piano lessons with Mrs. Thompson, $1.00.

Only in case of protracted illness (two weeks or more duration), certified by a physician's statement, can any deduction be made for absence from lessons. In such cases the pupil will pay at the above rates for the lessons he has received, and the balance of the tuition paid will be refunded. All claims of this nature must be made and settled before the end of the term in which the absence occurs.

Students may enter the Conservatory at any time, but it is greatly to their advantage to enter, if possible, at the beginning of the semester.

Students entering within two weeks of the beginning of the semester will be charged for the full semester; after that time for the remainder of the semester and one week additional.

Regular music students may take such academic or college work in addition to their music as may be agreed upon by the President of the College and the Dean of the Junior College, provided they have had at least two and a half years of high school work or the equivalent.

By a regular music student is meant any person who takes in addition to his music specialty the theoretical work required in the music course.

The above regulation in no way interferes with students entering for music only at the Conservatory, and taking such branches as they desire to take, in other words taking music as a special student.

Tuition per Semester.

The following table shows the rates of tuition for private lessons of thirty minutes in length, one lesson or two lessons a week:

	First Semester		Second Semester	
Vocal:	One	Two	One	Two
Alexander Stewart Thompson	$16.00	$30.00	$20.00	$37.50
Clara Dutton Thompson	16.00	30.00	20.00	37.50
Piano:				
Alexander Stewart Thompson	16.00	30.00	20.00	37.50
Preparatory Piano:				
Clara Dutton Thompson	13.00	23.00	15.00	27.00

	First Semester		Second Semester	
Harmony, Counterpoint or Fugue,	One	Two	One	Two
etc.: (Private)	$13.00	$23.00	$15.00	$27.00
Pipe Organ:				
Alexander Stewart Thompson	16.00	30.00	20.00	37.50
Clara Dutton Thompson	16.00	30.00	20.00	37.50
Brass Instruments:				
Charles L. Mundhenk	13.00	23.00	15.00	27.00

	First Semester		Second Semester	
Violin and String Instruments:	One	Two	One	Two
Georgine Van Aaken	$14.50	$27.00	$18.50	$33.00
Ensemble:				
Georgine Van Aaken	14.50	27.00	18.50	33.00

Class Lessons.

		Two Lessons a Week
Sight Singing Class:		
Not less than ten in a class (one hour a week)	$ 2.50	$ 3.50
Harmony class	8.50	11.50
Counterpoint and Fugue	11.00	14.00
Interpretation:		
Class limited to ten	6.50	8.50
Musical History	4.00	6.00

Other Expenses.

Piano Practice, one hour per day for the semester, $3.50; two hours per day, $6.50; three hours per day, $9.00.

Pipe Organ Practice, three hours per week for the semester, $6.00.

List of Students

SENIOR HONOR STUDENTS, 1909.

Each of the following has the highest average standing in the course represented:

S. H. Guernsey, Animal Husbandry.
V. D. Beard, Civil Engineering.
A. B. Street, Electrical Engineering.
Myrtle Person, Science.
W. J. Rhoades, Agronomy.
Neal Jongerwaard, Veterinary.
Florence Walls, Domestic Economy.
S. G. Platt, Horticulture.
C. E. Frudden, Mechanical Engineering.

Declamatory Contest, Spring Semester, 1908.

Oratorical Class—Rex Edgecomb, Bachelor. "The Man Who Gave Us an Empire."

Dramatic Class—Edna Barker, Quill. "The Absent Guest."

Oratorical Contest, Fall Semester, 1908.

First Prize—Shirley Allen, Bachelor. "Conservation of Our Natural Resources."

Second Prize—O. W. Johnson, Crescent. "American Public Sentiment."

Third Prize—C. R. Bush, Phileleutheroi. "The Power of Personality."

Inter-Society Debates, Spring Semester, 1908.

Question: "Resolved, That all transportation companies doing an inter-state business should be compelled to incorporate under a federal charter."

I. Debates in the Kennedy Cup Contest.

Following the debates of the fall semester, 1907, the following societies were left to compete for the first award of the Kennedy Cup: Phileleutheroi, Crescent, Bachelor and Welch. The debaters were as follows, the winning society being named first in each contest:

E. F. Ferrin, L. C. Shantz, George Nelson, Phileleutheroi vs. O. W. Johnson, C. R. Shumway, W. G. Langwill, Crescent.

A. C. Stelle, G. E. Farmer, G. Bader, Bachelor vs. D. Wheeler, Ellis Rail, J. Abrahamson, Welch.

Final contest:

E. F. Ferrin, L. C. Shantz, J. O. Rankin, Phileleutheroi vs, A. C. Stelle, G. E. Farmer, G. Bader, Bachelor.

II. Additional Inter-Society Debates:

H. F. Patterson, Theodore Sexauer, Philomathean vs. E. G. Cort, W. E. Reynolds, Pythian.

E. L. Quaife, A. E. Quaife, Philomathean vs. H. Vaughn, A. A. urger, Pythian.

H. T. Hill, E. S. Estel, F. B. Hammond, Jr., Forum vs. Beaufort erry, Rex Beresford, P. B. Clark, Beardshear.

INTER-SOCIETY DEBATES, SPRING SEMESTER, 1908.

Kennedy Cup Contest, second annual award, first series.

Question: "Resolved, That congress should establish a central bank ith branches."

G. W. Patterson, J. M. Fuller, P. E. Miller, Philomathean vs. J. H. urlingame, G. T. Guthrie, H. Hazen, Phileleutheroi.

R. G. Jones, R. J. Davidson, W. E. Reynolds, Pythian vs. G. E. Farmer, red Paulson, I. R. Meltzer, Bachelor.

W. Compton, H. C. Darger, F. B. Hammond, Jr., Forum vs. H. A. ittenbender, J. M. Tudor, J. G. Emerson, Welch.

Inter-Collegiate Debates, Spring Semester, 1908.

I. Freshmen of Iowa State College vs. Freshmen of Drake University.

Question: "Resolved, That Congress should encourage our merchant arine by a system of shipping subsidies."

Affirmative for Iowa State College, at Ames:
C. R. Hutcheson, Philomathean.
J. M. Tudor, Welch.
J. M. Fuller, Philomathean.
Negative for Iowa State College, at Drake University:
R. E. Jacques, Philomathean.
P. E. Miller, Philomathean.
R. G. Jones, Pythian.

II. State Triangular Debating League. (Iowa College, Drake Uni- ersity, Iowa State College). Third Annual Debate.

Question: "Resolved, That the 15th amendment should be repealed: e enforcement of the second section of the 14th amendment and the diffi- ulties of repeal not to enter into the discussion."

The affirmative team for Iowa State College, at Ames, against Drake niversity:
A. G. Thurman, Welch.
J. G. Emerson, Welch.
I. D. Hadley, Philomathean.

The negative team for Iowa State College, at Grinnell, against Iowa ollege:
H. Vaughn, Pythian.
Geo. W. Patterson, Philomathean.
C. W. Okey, Bachelor.

Inter-Collegiate Debates, Fall Semester, 1908.

Debating League of Iowa State College and Iowa State Normal. Thirteenth Annual Debate, third in the series of Dual Debates.

Question: "Resolved, That all transportation companies doing interstate business should be compelled to incorporate under a federal charter."

The affirmative team for Iowa State College, at Cedar Falls:

E. L. Quaife, Philomathean.

H. T. Hill, Forum.

E. F. Ferrin, Phileleutheroi.

The negative team for Iowa State College, at Ames:

G. E. Farmer, Bachelor.

C. R. Shumway, Crescent.

O. W. Johnson, Crescent.

Inter-Collegiate Debates, Spring Semester, 1909.

I. State Triangular Debating League. (Iowa College, Drake University, Iowa State College). Fourth Annual Debate.

Question: "Resolved, That congress should establish a central bank."

The affirmative team for Iowa State College, at Ames, against Iowa College:

W. E. Reynolds, Pythian.

P. E. Miller, Philomathean.

F. B. Hammond, Jr., Forum.

The negative team for Iowa State College at Drake, against Drake University:

J. H. Burlingame, Phileleutheroi.

R. G. Jones, Pythian.

J. M. Fuller, Philomathean.

II. Freshmen of Iowa State College against Freshmen of Drake University.

Question: "Resolved, That the products of convict labor should not be placed on the market in competition with free labor."

Affirmative for Iowa State College, at Ames:

Joe Naylor, Philomathean.

A. E. Fowler, Bachelor.

G. E. Rogers, Bachelor.

Negative for Iowa State College, at Drake University:

Lee Smith, Welch.

Hugh Webster, Crescent.

I. F. Gilmore, Philomathean.

GRADUATES.

Candidates for the Degree of Master of Scientific Agriculture.

Barker, J. F., B. S. A., (Ohio State University) 1908, Soils.
Churchill, F. G., B. S. A., (Iowa State College) 1908, Animal Husbandry.
Evans, C. M., B. S. A., (A. and M. College of Texas) 1908, Animal Husbandry.
Greene, Laurenz, B. S., (Kansas State Agricultural College) 1906, Horticulture.
Haskill, E. S., B. S. A., (Iowa State College) 1908, Soils.
Jeffs, Royal E., B. S. A., (Iowa State College) 1906, Botany.
Kildee, H. H., B. S. A., (Iowa State College) 1908, Animal Husbandry.
Madson, B. A., B. S. A., (Iowa State College) 1907, Chemical Section.
Merritt, M. L., B. S. A., (Iowa State College) 1904, Horticulture.
Phillips, H. H., B. S. A., (Iowa State College) 1908, Animal Husbandry.
Smith, Orma J. B., B. S., (Ohio State University) 1907, Horticulture.
Wentworth, E. N., B. S. A., (Iowa State College) 1907, Animal Husbandry.
Total, 14.

Candidates for the Degree of Master of Science.

Hayden, Ada, B. S., (Iowa State College) 1907, Botany.
Ness, Henry, B. S. A., (Iowa State College) 1905, Zoology.

SENIORS

NAME	COURSE	TOWN	COUNTY
Agne, Glen L.,	A. H.,	Tipton,	Cedar.
Allen, Shirley W.,	Hort.,	Des Moines,	Polk.
Amesbury, H. C.,	C. E.,	Ames,	Story.
Anderson, A. L.,	Agron.,	Ames,	Story.
Andrews, Earle D.,	C. E.,	Waterloo,	Blackhawk.
Andrews, Rollin G.,	Sci.,	Omaha,	*Nebraska.*
Archer, Dorothy,	Sci.,	Sheldon.	O'Brien.
Bakke, A. L.,	Sci.,	Forest City,	Winnebago.
Beard, Vivian D.,	C. E.,	Osceola,	Clarke.
Bek, Hugh E.,	E. E.,	Massena,	Cass.
Bernick, Fritz,	E. E.,	Buffalo,	Scott.
Bielenberg, C. F.,	E. E.,	Keystone,	Benton.
Billedo, Mariano,	Agron.,	Bangrud,	*Abra, P. I.*
Black, Elmer,	Vet.,	Ames,	Story.
Boardman, Lois K.,	Sci.,	Nevada,	Story.
Bodwell, R. E.,	E. E.,	Ida Grove,	Ida.
Booth, J. Francis.,	C. E.,	Anita,	Cass.
Boyd, Lee R.,	C. E.,	Ames,	Story.
Breeden, F. L.,	E. E.,	Grinnell,	Poweshiek.
Brubacher, R. R.,	C. E.,	Storm Lake,	Buena Vista.
Brugger, Fred,	E. E.,	Lake City,	Calhoun.
Burkhart, Roy F.,	E. E.,	Hawkeye,	Fayette.
Burris, John A.,	C. E.,	What Cheer,	Keokuk.
Bush, Chas. R.,	A. H.,	Washta,	Cherokee.
Caldwell, H. V.,	Agron.,	Ames,	Story.
Campbell, Paul C.,	C. E.,	Clear Lake,	Cerro Gordo.

Carlson, W. R.,	C. E.,	Hampton,	Franklin.
Carr, E. B.,	E. E.,	Swaledale,	Cerro Gordo.
Case, H. M.,	Hort.,	Chicago,	*Illinois.*
Chappel, M. E.,	C. E.,	Des Moines,	Polk.
Clark, Sadie,	Sci.,	Ames,	Story.
Clayton, D. Walter,	M. E.,	Sibley,	Osceola.
Cockfield, J. Harry,	M. E.,	Cedar Rapids,	Linn.
Collins, Edgar V.,	Agron.,	Marshalltown,	Marshall.
Cooper, Clifford W.,	E. E.,	Ames,	Story.
Cowan, L. F.,	C. E.,	Iowa Falls,	Hardin.
Cox, Frank,	A. H.,	Adair,	Adair.
Craig, Dan S.,	C. E.,	Des Moines,	Polk.
Crawford, M. O.,	M. E.,	Ames,	Story.
Crouse, R. C.,	E. E.,	Prescott.	Adams.
Cunningham, A. H.,	C. E.,	Goldfield.	Wright.
Darling, Eugene,	A. H.,	Ames,	Story.
Davis, Harry K.,	C. E.,	Knoxville,	Marion.
Davis, J. Walter,	A. H.,	Avoca,	Pottawattamie.
Day, Georgia E.,	Sci.,	Keosauqua,	Van Buren.
Dorman, B. L.,	C. E.,	Ames,	Story.
Dyer, Ruth,	Sci.,	Nevada,	Story.
Eby, Valentine V.,	C. E.,	Monticello,	Jones.
Edwards, Oscar,	E. E.,	Dow City,	Crawford.
Ellis, W. V.,	Vet.,	Ames,	Story.
Ewers, Ruth,	D. E.,	Boone,	Boone.
Farmer, Geo. E.,	Sci.,	Sioux Rapids,	Buena Vista.
Farnsworth, F. B.,	M. E.,	Galva,	Ida.
Farnum, Faye,	Sci.,	Ames,	Story.
Ford, J. Clyde,	C. E.,	Des Moines,	Polk.
Forman, L. W.,	Agron.,	Ames,	Story.
French, Leslie R.,	C. E.,	Hawarden.	Sioux.
Frevert, G. E.,	Dairy,	Odebolt,	Sac.
Frudden, C. E.,	M. E.,	Charles City,	Floyd.
Gamrath, Carl,	Vet.,	Ames,	Story.
Garner, Della,	Sci.,	Ida Grove,	Ida.
Garver, Samuel,	Agron.,	Farmington,	Van Buren.
Gillette, Millie,	Sci.,	Fostoria,	Clay.
Gilmore, W. J.,	C. E.,	Nevada,	Story.
Godfrey, G. W.,	A. H.,	Luverne,	Kossuth.
Gonzalez, Juan A.,	Agron.,	Monclova,	*Coahiula, Mex.*
Gordon, B. E.,	E. E.,	Hedrick,	Keokuk.
Gray, R. B.,	E. E.,	Des Moines,	Polk.
Green, W. M.,	C. E.,	Ames.	Story.
Griggs, E. V.,	M. E.,	Ames,	Story.
Griswold, Don T.,	A. H.,	Montrose,	Lee.
Guernsey, S. C.,	A. H.,	Plano,	Appanoose.
Guthrie, G. T.,	Dairy,	Coin,	Page.
Hall, Herman,	M. E.,	Ames,	Story.
Hanssen, D. W.,	E. E.,	Carroll,	Carroll.
Harris, Carl E.,	C. E.,	Fairfield,	Jefferson.
Haskins, W. A.,	Agron.,	Whitten,	Hardin.
Hauser, B. B.,	C. E.,	Ames.	Story.
Hazen, Harvey,	A. H.,	Denmark,	Lee.
Heath, Royce,	C. E.,	Ames,	Story.
Heaton, Edward B.,	A. H.,	Shannon City,	Union.
Hewitt, C. M.,	M. E.,	Morning Sun,	Louisa.
Hitchcock, R. B.,	M. E.,	Greenfield.	Adair.
Hites, L. V.,	C. E.,	Des Moines,	Polk.
Hopkins, Ella,	Sci.,	Nevada,	Story.

Hopkins, Frances,	D. E.,	Nevada,	Story.
Horneman, Herman,	Dairy,	Ames,	Story.
Horton, Maude E.,	Sci.,	Ames,	Story.
Hubbard, Homer,	M. E.,	Ida Grove,	Ida.
Huffman, O. L.,	C. E.,	Wyoming,	Jones.
Hugg, John,	M. E.,	Polk,	Polk.
Humphrey, Mark,	E. E.,	Marshalltown,	Marshall.
Hutchison, Bryce,	Mn. E.,	Ames,	Story.
Hutchinson, L. S.,	Mn. E.,	Iowa Falls,	Hardin.
Jepson, M. S.,	A. H.,	Moorehead,	Monona.
Johnson, O. W.,	A. H.,	LeGrand,	Marshall.
Jones, Floyd D.,	C. E.,	Ames,	Story.
Jones, Gertrude,	D. E.,	Ames,	Story.
Jones, Ralph H.,	C. E.,	Humboldt,	Humboldt.
Jongewaard, Neal,	Vet.,	Sioux Center,	Sioux.
KaDel, Orpha,	Sci.,	Ames,	Story.
Kalb, H. N.,	E. E.,	Denison,	Crawford.
Kelley, Earl F.,	C. E.,	Hampton,	Franklin.
Kelsey, L. D.,	C. E.,	Des Moines	Polk.
Kerr, F. L.,	A. H.,	Manilla,	Crawford.
King, Harry W.,	E. E.,	Waterloo,	Blackhawk.
King, J. E.,	E. E.,	Ames,	Story.
Kirkpatrick, J. G.,	E. E.,	Waterloo,	Blackhawk.
Kirkpatrick, K. A.,	Hort.,	South English,	Keokuk.
Knapp, Seaman,	C. E.,	Ames.	Story.
Kulp, A. I.,	Vet.,	Adel,	Dallas.
ambert, E. W.,	Mn. E.,	Ames,	Story.
ambert, Guy,	Dairy,	Ames,	Story.
ane, W. G.,	E. E.,	Mason City,	Cerro Gordo.
arson, Frank W.,	Vet.,	Meltonville,	Worth.
aw, F. W.,	Vet.,	Ames,	Story.
eckliter, W. H.,	C. E.,	Corning,	Adams.
eibrock, L. L.,	Mn. E.,	Elkader,	Clayton.
idvall, Ed.,	Mn. E.,	Dayton,	Webster.
ister, J. A.,	M. E.,	Sibley,	Osceola.
ockwood, R. L.,	C. E.,	Osceola,	Clark.
uick, H. F.,	A. H.,	Belmond,	Wright.
aine, Kenneth,	M. E.,	Des Moines,	Polk.
anson, Frank R.,	E. E.,	Sibley,	Osceola.
artin, Chas. W.,	A. H.,	Carroll,	Carroll.
ason, Ralph J.,	A. H.,	Iowa Falls,	Hardin.
axwell, Mildred,	Sci.,	Ames,	Story.
errill, J. W.,	A. H.,	Ames,	Story.
etcalf, J. T.,	A. H.,	Paullina,	O'Brien.
iller, R. B.,	C. E.,	Storm Lake,	Buena Vista.
ills, Geo. A.,	E. E.,	Waterloo,	Blackhawk.
ilton, I. L.,	E. E.,	Stanwood,	Cedar.
iner, Ward,	A. H.,	Shell Rock,	Butler.
inert, Jessie,	Sci.,	Ames,	Story.
oore, R. S.,	C. E.,	Davenport,	Scott.
ortensen, Martin,	Dairy,	Ames,	Story.
urphy, John L.,	Agron.,	Reinbeck,	Grundy.
cCain, G. L.,	M. E.,	Des Moines,	Polk.
cCulla, Alma,	Sci.,	St. Ansgar,	Mitchell.
cCullough, T. E.,	C. E.,	Davenport,	Scott.
cElyea, H. B.,	E. E.,	Ames,	Story.
iden, Fred,	C. E.,	Woodward,	Dallas.
zarene, E. G.,	M. E.,	Dallas Center,	Dallas.
lson, L. A.,	Agron.,	Harlan,	Shelby.

Nichols, C. S.,	C. E.,	Ames,	Story.
Okey, C. W.,	C. E.,	Prescott,	Adams.
Orr, Harry,	C. E.,	Waukon,	Allamakee.
Packman, M. E.,	E. E.,	Eagle Grove,	Wright.
Paine, F. D.,	E. E.,	Algona,	Kossuth.
Paul, D. J.,	C. E.,	Paullina,	O'Brien.
Paulson, Fred,	E. E.;	Avoca,	Pottawattamie
Person, Myrtie,	Sci.,	Sibley,	Osceola.
Platt, S. G.,	Hort.,	Oelwein,	Fayette.
Prime, Vera,	Sci.,	Ames,	Story.
Prior, LaRue,	E. E.,	Marion,	Linn.
Quaife, A. E.,	Agron.,	Ionia,	Chickasaw.
Rhine, E. B.,	C. E.,	Eldora,	Hardin.
Rhoades, W. J.,	Agron.,	Oakland.	Pottawattamie
Riedesel, R. C.,	M. E.,	Charter Oak,	Crawford.
Rightmire, J. F.,	C. E.,	Ames,	Story.
Rowat, J. F.,	C. E.,	Des Moines,	Polk.
Ruppel, A. C.,	A. H.,	Webster City,	Hamilton.
Russell, H. Monroe,	A. H.,	Sibley,	Osceola.
Sanders, Gilbert,	C. E.,	Postville.	Allamakee.
Schaeffer, L. L.,	Hort.,	Eagle Grove,	Wright.
Schenk, E. E.,	C. E.,	Waterloo.	Blackhawk.
Schjeldahl, T.,	C. E.,	Highlandville,	Winneshiek.
Schlick, W. J.,	C. E.,	Indianola,	Warren.
Schmidt, Will,	C. E.,	Avoca,	Pottawattamie
Schnaidt, W. F.,	Agron.,	Independence,	Pocahontas.
Scholten, H. M.,	C. E.,	Alton,	Sioux.
Schreiber, Fred,	C. E.,	Chariton,	Lucas.
Schworm, F. G.,	C. E.,	Nevada,	Story.
Sexauer, Theo.,	Agron.,	Ankeny,	Polk.
Sexsmith, Perlee,	E. E.,	West Liberty,	Muscatine.
Shannon, C. W.,	Vet.,	Grant City,	Sac.
Shannon, J. L.,	Vet.,	Barbados,	*West Indies.*
Smith, H. C.,	E. E.,	Britt,	Hancock.
Smith, L. E.,	Vet.,	Jefferson,	Greene.
Smith, Roy E.,	Agron.,	Canton,	*South Dakota.*
Smith, Wilbur C.,	Vet.,	Ames,	Story.
Snyder, Carl J.,	E. E.;	Ames,	Dubuque.
Sones, C. M.,	E. E.	Dubuque,	Jones.
Sonner, Gussie,	Sci.,	Anamosa,	Keokuk.
Stewart, Everett,	Agron.,	Ollie.	Washington.
Stong, G. C.,	Vet.,	Washington,	Van Buren.
Street, A. B.,	E. E.,	Kilbourne,	Story.
Strother, R. R.,	C. E.,	Hubbard,	Hardin.
Summers, J. F.,	A. H.,	Malvern,	Mills.
Todnem, O. H.,	Mn. E.,	Ames,	Story.
Tusant, W. E.,	C. E.,	Des Moines.	Polk.
Underwood, Jean R.,	Vet.,	Ames,	Story.
Upton, Louise,	Sci.,	Fayette,	Fayette.
Van de Steeg, G. J.,	E. E.,	Orange City,	Sioux.
Van de Waa, Henry,	Vet.,	Orange City,	Sioux.
Van Duzer, Pearl,	Sci.,	Ontario,	Story.
Velander, Verne,	M. E.,	Stanton,	Montgomery.
Vincent, Frank C.,	M. E.,	Ames,	Story.
Waggoner, J. E.,	Ag. E.,	Primghar,	O'Brien.
Wagner, H. W.,	E. E.,	Calamus,	Clinton.
Walls, Florence,	D. E.,	Clinton.	Clinton.
Wambeam, Henry I.,	E. E.,	Ames,	Story.
Ware, S. H.,	C. E.,	Webster City,	Hamilton.

Warsaw, C. E.,	E. E.,	Riceville,	Mitchell.
Watts, Ruth R.,	Sci.,	Ames,	Story.
Waugh, E. N.,	A. H.,	Roland,	Story.
White, Homer,	M. E.,	Keokuk,	Lee.
Williams, C. M.,	M. E.,	Parkersburg,	Butler.
Williams, L. A.,	E. E.,	Council Bluffs,	Pottawattamie.
Wilson, Platt,	C. E.,	Montezuma,	Poweshiek.
Witmer, Stuart,	C. E.,	Des Moines,	Polk.
Young, C. R.,	A. H.,	Ames,	Story.
Zimmerman, Phoebe,	Sci.,	Ames,	Story.
Zornig, H. H.,	E. E.,	Newhall,	Benton.

Total, 214.

JUNIORS

NAME	COURSE	TOWN	COUNTY
Adams, Harold E.,	C. E.,	Cedar Rapids,	Linn.
Amondson, O. L.,	M. E.,	Dows,	Wright.
Andre, Edna,	Sci.,	Schaller,	Sac.
Armstrong, Alice,	Sci.,	Chicago,	*Illinois.*
Austin, Fred H.,	C. E.,	Webster City,	Hamilton.
Baker, Margaret,	D. E.,	Rockwell City,	Calhoun.
Barndt, H. P.,	Mn. E.,	Des Moines,	Polk.
Barry, O. T.,	M. E.,	Cedar Rapids,	Linn.
Barton, Ray,	A. H.,	Luverne,	Kossuth.
Beard, C. B.,	C. E.,	Des Moines,	Polk.
Beattie, Wm. S.,	C. E.,	Weldon,	Decatur.
Beecher, Milton F.,	Ceramics,	Mason City,	Cerro Gordo.
Bergman, H. Dale,	Vet.,	Newton,	Jasper.
Beuck, Henry,	A. H.,	Avoca,	Pottawattamie.
Bittenbender, H. A.,	A. H.,	Osage,	Mitchell.
Black, Clyde,	Hort.,	Dexter,	Dallas.
Black, Wm. H.,	A. H.,	Fort Dodge,	Webster.
Blumenshein, Ed.,	C. E.,	Rhodes,	Marshall.
Board, A. R.,	E. E.,	Marcus,	Cherokee.
Boden, O. G.,	C. E.,	Ames,	Story.
Boling, A. J.,	M. E.,	Bagley,	Guthrie.
Bolles, Lawrence,	C. E.,	Ames,	Story.
Booher, Edith,	Sci.,	Danbury,	Woodbury.
Broadie, R. W.,	C. E.,	Waverly,	Bremer.
rown, C. W.,	Vet.,	Dana,	Greene.
uchanan, John,	Sci.,	Eagle Grove,	Wright.
uell, W. E.,	C. E.,	Lyons,	Clinton.
ullen, A.,	M. E.,	Pueblo,	*Colorado.*
urger, A.,	A. H.,	Van Meter,	Dallas.
utler, D. V.,	C. E.,	Nashua,	Chickasaw.
able, Emil Y.,	Agron.,	Waterloo,	Blackhawk.
alonky, Josephine,	Sci.,	Woodward,	Dallas.
ampbell, George S.,	M. E.,	Newton,	Jasper.
ampbell, J. R.,	Hort.,	Webster City,	Hamilton.
arlson, R. Q.,	A. H.,	Meriden,	Cherokee.
arpenter, Burton,	M. E.,	State Center,	Marshall.
arpenter, J. C.,	C. E.,	Cresco,	Howard.
arson, H. J.,	M. E.,	Council Bluffs,	Pottawattamie.
ase, Orrin,	C. E.,	McIntyre,	Mitchell.
atterton, Ralph,	E. E.,	Peterson,	Clay.
eney, H. C.,	A. H.,	Emerson,	Mills.
ark, P. B.,	M. E.,	Yetter,	Calhoun.
eveland, W. J.,	Vet.,	Humboldt,	Humboldt.

Cline, J. D.,	Vet.,	Ames,	Story.
Collins, Floyd F.,	A. H.,	Boone,	Boone.
Cooley, D. M.,	M. E.,	Strawberry Point,	Clayton.
Cooney, F. H.,	C. E.,	Coon Rapids,	Carroll.
Cooper, Elmer E.,	A. H.,	Corning,	Adams.
Copeland, F. B.,	Vet.,	Logan,	Harrison.
Corlette, Lyle,	E. E.,	Ames,	Story.
Corneliusen, C. W.,	E. E.,	Alta,	Buena Vista.
Coutts, H. G.,	C. E.,	Grinnell,	Poweshiek.
Cover, L. G.,	E. E.,	Dunlap,	Harrison.
Cox, I. W.,	C. E.,	Ames,	Story.
Cox, L. W.,	C. E.,	Ames,	Story.
Coykendall, C.,	C. E.,	Deadham,	Carroll.
Crawford, Nate N.,	Vet.,	Waukon,	Allamakee.
Creel, Edward J.,	A. H.,	Chihuahua,	*Mexico.*
Crewdson, Archie,	Vet.,	Woodbine,	Harrison.
Crowley, P. W.,	Dairy,	Galva,	Ida.
Davidson, R. J.,	A. H.,	Brooklyn,	Poweshiek.
Davis, R. E.,	M. E.,	New Virginia,	Warren.
Deakin, Merrill,	C. E.,	Ames,	Story.
Dengler, Harold,	M. E.,	Ames,	Story.
Dorsey, S. H.,	M. E.,	Greenfield,	Adair.
Dragoun, Frank,	C. E.,	Toledo,	Tama.
Eby, Chas. W.,	C. E.,	Waterloo,	Blackhawk.
Egan, Chas. B.,	C. E.,	Atlantic,	Cass.
Estel, Edward S.,	Dairy	Marshalltown,	Marshall.
Evans, J. P.,	C. E.,	Marcus,	Cherokee.
Everett, Edna,	Sci.,	Spirit Lake,	Dickinson.
Evers, Harry C.,	Vet.,	Iowa Falls,	Hardin.
Ewen, Earl,	A. H.,	Callender,	Webster.
Ferrin, E. F.,	A. H.,	Cherokee,	Cherokee.
Folker, A. D.,	A. H.,	Mount Sterling,	Van Buren.
Forrest, A.,	Dairy,	Garner,	Hancock.
Fowler, E. S.,	C. E.,	Radcliffe,	Hardin.
France, B. L.,	A. H.,	Moville,	Woodbury.
Fultz, F. G.,	Vet.,	Ames,	Story.
Gibson, F. W.,	E. E.,	Terrill,	Dickinson.
Gilbert, Guy,	Vet.,	Gilbert,	Story.
Gilbert, Ray,	Vet.,	Gilbert,	Story.
Glidden, Edith,	Sci.,	Ames,	Story.
Gockley, W. L.,	M. E.,	Whittemore,	Kossuth.
Graham, Chas. H.,	A. H.,	Ames,	Story.
Graham, M. L.,	Mn. E.,	Ames,	Story.
Graham, Robt.,	Vet.,	Ames,	Story.
Greer, Murl,	Sci.,	Ames,	Story.
Gregory, C. V.,	A. H.,	Burchinal,	Cerro Gordo.
Hallowell, Inez,	D. E.,	Dow City,	Crawford.
Hamilton, J. W.,	Vet.,	Hawarden,	Sioux.
Hansen, R. E.,	Vet.,	Forest City,	Winnebago.
Harp, Paul W.,	A. H.,	Prairie City,	Jasper.
Haw, Elmer,	C. E.,	Ottumwa,	Wapello.
Hawk, F. D.,	Agron.,	Cedar Falls,	Blackhawk.
Heggin, Albin,	A. H.,	Des Moines,	Polk.
Herbert, H. M.,	A. H.,	Atlantic,	Cass.
Hill, Howard T.,	Sci.,	Ames,	Story.
Horton, J. O.,	C. E.,	Nashua,	Chickasaw.
Hukill, E. C.,	A. H.,	Des Moines,	Polk.
Hultman, Arthur,	E. E.,	Sioux City	Woodbury.
Hutton, M. L.,	C. E.,	Columbus Jct.,	Louisa.

Hyland, John,	C. E.,	Osceola,	Clark.
Jackson, H. D.,	E. E.,	Ames,	Story.
Johnson, Fred B.,	E. E.,	Waukon,	Allamakee.
Johnson, G. B.,	E. E.,	Decorah,	Winneshiek.
Johnson, R. C.,	E. E.,	Hawarden,	Sioux.
Johnston, W. D.,	C. E.,	Waterloo,	Blackhawk.
Joiner, M. W.,	A. H.,	Maquoketa,	Jackson.
Jones, F. O.,	C. E.,	Ames,	Story.
Jones, Helen,	D. E.,	Allison,	Butler.
Jones, H. W.,	C. E.,	Ames,	Story.
Kemler, C. H.,	C. E.,	Dubuque,	Dubuque.
Knowles, Frank,	Mn. E.,	Kingsley,	Plymouth.
Knox, A. B.,	M. E.,	Cherokee,	Cherokee.
Knudson, Susie,	Sci.,	Nevada,	Story.
Korf, E. T.,	C. E.,	Newton,	Jasper.
Kraft, John,	C. E.,	Des Moines,	Polk.
Kyhl, Louis C.,	E. E.,	Miles,	Jackson.
Lan, E. F.,	Vet.,	Buenos Aires,	*Argentine Rpblc.*
Landes, Gene B.,	M. E.,	Keosauqua,	Van Buren.
Langseth, Ruth,	D. E.,	Dixon,	Scott.
Laughlin, F. L.,	A. H.,	Osage,	Mitchell.
Law, V. V.,	M. E.,	Ames,	Story.
Leffler, J. M.,	A. H.,	Stockport,	Van Buren.
Legenhausen, A. H.,	Vet.,	Fenton,	Kossuth.
Lemon, L. Clyde,	C. E.,	Spirit Lake,	Dickinson.
Lockwood, Howard,	A. H.,	Central City,	Linn.
Loring, D. M.,	C. E.,	Lone Tree,	Johnson.
Loudermilk, H. K.,	Mn. E.,	Des Moines,	Polk.
Lungren, A. F.,	Sci.,	Gowrie,	Webster.
Madson, Anna,	D. E.,	Ames,	Story.
Mantor, H. O.,	Vet.,	Salt Lake City,	*Utah.*
Martin, C. E.,	C. E.,	Des Moines,	Polk.
Mason, J. W.,	E. E.,	Hedrick,	Keokuk.
Matter, Otto,	E. E.,	Polk,	Polk.
Maytag, L. B.,	M. E.,	Newton,	Jasper.
Menary, A. R.,	Vet.,	Cedar Rapids,	Linn.
Mercer, J. M.,	E. E.,	Greenfield,	Adair.
Merten, C. E.,	C. E.,	Garner,	Hancock.
Meyer, J. E.,	C. E.,	Marcus,	Cherokee.
Miller, H. C.,	C. E.,	Eldora,	Hardin.
Mirick, Maude,	Sci.,	Monticello,	Jones.
Morrison, G. W.,	M. E.,	Adelphi,	Polk.
Morrow, C. H.,	M. E.,	Conrad,	Grundy.
Murphy, W. B.,	A. H.,	Springfield,	*Ohio.*
Myerly, H. B.,	M. E.,	Des Moines,	Polk.
Myers, B. S.,	C. E.,	Dexter,	Dallas.
Myers, L. C.,	A. H.,	Shell Rock,	Butler.
McArthur, Wm.,	A. H.,	Mason City,	Cerro Gordo.
McCall, Thos.,	Hort.,	Ames,	Story.
McCartney, H. E.,	A. H.,	Geneva,	*Nebraska.*
McCormick, Robt.,	C. E.,	Des Moines,	Polk.
McCulloch, B. E.,	Vet.,	Donnellson,	Lee.
McDonald, Mae,	D. E.,	Jewell,	Hamilton.
McElhinney, Ralph,	Agron.,	Waterloo,	Blackhawk.
McElroy, D. W.,	E. E.,	Keokuk,	Lee.
McFarland, F. M.,	E. E.,	Harlan,	Shelby.
McKeen, Jesse,	Sci.,	Tama,	Tama.
elson, Geo. M.,	A. H.,	Goldfield,	Wright.
icolay, J. J.,	M. E.,	Postville,	Allamakee.

Noble, J. A.,	E. E.,	Ames,	Story.
Nygren, H. J.,	Vet.,	Lake City,	Calhoun.
O'Donnell, M. W.,	A. H.,	Ames,	Story.
O'Leary, J. E.,	C. E.,	Mason City,	Butler.
Olsen, Athyl,	D. E.,	Sac City,	Sac.
Palmer, W. H.,	C. E.,	Des Moines,	Polk.
Pammel, Edna,	Sci.,	Ames,	Story.
Parsons, Amy,	D. E.,	Keokuk,	Lee.
Patterson, Geo. W.,	A. H.,	Burt,	Kossuth.
Person, L. C.,	A. H.,	Sibley,	Osceola.
Peters, Claude H.,	E. E.,	Grinnell,	Poweshiek.
Pooley, R. J.,	C. E.,	Greene,	Butler.
Prouty, E. D.,	M. E.,	Keokuk,	Lee.
Randau, Fred,	A. H.,	Ames,	Story.
Ray, Frank,	Hort.,	Des Moines,	Polk.
Reeves, A. B.,	C. E.,	Sibley,	Osceola.
Reppert, Phil L.,	M. E.,	Cumberland,	Cass.
Reynolds, W. E.,	C. E.,	Storm Lake,	Buena Vista.
Roberts, Coral,	D. E.,	Marathon,	Buena Vista.
Rohrer, D. E.,	C. E.,	Joplin,	*Missouri.*
Rutledge, I. C.,	Agron.,	Fort Dodge,	Webster.
Sanders, J. S.,	Vet.,	Ames,	Story.
Schader, F. M.,	C. E.,	Preston,	Jackson.
Schemann, C. H.,	C. E.,	Des Moines,	Polk.
Schroeder, E. F.,	E. E.,	Davenport,	Scott.
Scoates, Daniel,	C. E.,	South Milwaukee,	*Wisconsin.*
Scothorn, R. A.,	Vet.,	Oelwein,	Fayette.
Scott, C. E.,	Mn. E.,	Shelby,	Shelby.
Semmons, Mildred,	Sci.,	Ames,	Story.
Sherwood, Ross,	A. H.,	Shabbona,	*Illinois.*
Shumway, C. R.,	A. H.,	State Center,	Marshall.
Sloan, M. Luther,	Sci.,	Sioux City,	Woodbury.
Smith, Cecile,	Sci.,	Ames,	Story.
Soth, A. A.,	M. E.,	Toledo,	Tama.
Sprague, A. W.,	Vet.,	Council Bluffs,	Pottawattami
Springer, Spencer,	E. E.,	Eddyville,	Wapello.
Steigerwalt, Sam,	C. E.,	Ames,	Story.
Stewart, B. J.,	E. E.,	Davenport,	Scott.
Stewart, Dale B.,	Vet.,	Maynard,	Fayette.
Storms, Laura,	D. E.,	Ames,	Story.
Strong, Harry,	M. E.,	Humboldt,	Humboldt.
Taylor, Ilo I.,	C. E.,	Ames,	Story.
Tellier, G. H.,	Dairy,	Humboldt,	Humboldt.
Thomas, Roy,	Mn. E.,	Buxton,	Monroe.
Thornburg, N. G.,	A. H.,	Linden,	Dallas.
Thornton, H. L.,	A. H.,	Aledo,	*Illinois.*
Tracy, F. C.,	A. H.,	Nashua,	Chickasaw.
Troutner, Edith,	Sci.,	Charles City,	Floyd.
Trullinger, Robt.,	C. E.,	Farragut,	Fremont.
Van Meter, M. E.,	E. E.,	Manilla.	Crawford.
Van Slyke, F. C.,	C. E.,	Mitchellville,	Polk.
Walker, H. B.,	C. E.,	Des Moines	Polk.
Wallace, H. A.,	A. H.,	Des Moines,	Polk.
Wallis, R. S.,	C. E.,	Ames,	Story.
Weirick, Ray,	C. E.,	Ames,	Story.
Wentworth, W. A.,	Agron.,	State Center,	Marshall.
Wettengel, Frank,	E. E.,	Dunlap,	Harrison.
Whalen, W. T.,	E. E.,	Boone,	Boone.
White, Myrtle,	Sci.,	Ames,	Story.

White, Ross,	C. E.,	Bagley,	Guthrie.
White, S. K.,	Hort.,	Hartford,	Warren.
Wilson, Ralph E.,	M. E.,	Stanwood,	Cedar.
Winslow, L. M.,	A. H.,	Ames,	Story.
Wood, J. R.,	M. E.,	Ames,	Story.
Yoemans, Homer,	M. E.,	Ames,	Story.
Yocum, J. R.,	E. E.,	Des Moines,	Polk.
Young, G. H.,	Agron.,	Des Moines,	Polk.

Total, 228.

SOPHOMORE

NAME	COURSE	TOWN	COUNTY
Amborn, Rolla,	M. E.,	Fort Madison,	Lee.
Amesbury, Ernest,	C. E.,	Des Moines,	Polk.
Anderson, May,	D. E.,	Ames,	Story.
Armour, H. B.,	C. E.,	Little Rock,	Lyon.
Arnold, Maud,	Sci.,	Ames,	Story.
Arthur, Chas. S.,	C. E.,	Spirit Lake,	Dickinson.
Athanasian, Basil,	Agron.,	Balgrad,	*Russia.*
Baker, A. G.,	C. E.,	Eldora,	Hardin.
Baker, H. R.,	Mn. E.,	Eldora,	Hardin.
Baker, Osman,	A. H.,	Edmund,	*Wisconsin.*
Baldwin, W. H.,	E. E.,	Braddyville,	Page.
Ballantyne, F. I.	M. E.,	Des Moines,	Polk.
Barry, R. J.,	E. E.,	Cedar Rapids,	Linn.
Barton, Josephine,	Sci.,	Ames,	Story.
Bashford, Louis G.,	C. E.,	Clarksville,	Butler.
Baxter, Robt. B.,	A. H.,	Galva,	Ida.
Baxter, Sam,	A. H.,	Buckingham,	Tama.
Beardshear, Chas.,	Dairy,	Ames,	Story.
Beardshear, Wm. M.,	Sci.,	Ames,	Story.
Bechtle, G. C.,	E. E.,	LeMars.	Plymouth.
Beinhart, E. G.,	A. H.,	Ames,	Story.
Beiter, Grover,	C. E.,	Carroll,	Carroll.
Bemis, Paul R.,	A. H.,	Bondurant,	Polk.
Benson, Arthur W.,	C. E.,	Des Moines,	Polk.
Beresford, Rex,	A. H.,	Vinton,	Benton.
Bergen, Hansen,	Sci.,	Dubuque,	Dubuque.
Bevins, Noel,	Vet.,	Hawkeye,	Fayette.
Beverly, A. L.,	Vet.,	Ames,	Story.
Bielenberg, T.,	E. E.,	Catford,	*England.*
Blair, Jas. R.,	C. E.,	Ames,	Story.
Blake, Fred N.,	A. H.,	Maquoketa,	Jackson.
Bornn, A. L.,	Vet.,	Story City,	Story.
Bowen, John H.,	Vet.,	West Union,	Fayette.
Brennan, J. L.,	Mn. E.,	McGregor,	Clayton.
Brennan, Regina,	D. E.,	McGregor,	Clayton.
Bristol, Fred,	C. E.,	Des Moines,	Polk.
Brotchie, Ralph,	C. E.,	Atalissa,	Muscatine.
rown, Chas. E.,	Mn. E.,	Sibley,	Osceola.
rown, E. H.,	C. E.,	Albert Lee,	*Minnesota.*
rown, Fay M.,	D. E.,	Council Bluffs,	Pottawattamie.
rown, Joe,	E. E.,	Sioux City,	Woodbury.
rown, Roy E.,	Vet.,	Ames,	Story.
rown, Seth A.,	E. E.,	Manchester,	Delaware.
rush, Geo.,	E. E.,	Traer	Tama.
uck, Allan P.,	Vet.,	Ames,	Story.
uck, David,	A. H.,	Rhodes,	Marshall.
uck, Floyd L.,	Vet.,	Ames,	Story.

Ferguson, Myrtle,	D. E.,	Sioux City,	Woodbury.
Buckland, Wm. W.,	A. H.,	Ames,	Story.
Buffington, Clyde,	A. H.,	Glenwood,	Mills.
Bunting, John W.,	C. E.,	College Springs,	Page.
Burgeson, J. A.,	E. E.,	Ames,	Story.
Burling, Helen A.,	Sci.,	Eldora,	Hardin.
Burlingame, J. Homer,	C. E.,	Cherokee,	Cherokee.
Cameron, Hurst M.,	Vet.,	Montezuma,	Poweshiek.
Cameron, Will,	E. E.,	Ames,	Story.
Campbell, Clarence,	E. E.,	Farragut,	Fremont.
Capper, Chas.,	C. E.,	Ames,	Story.
Carpenter, Clinton C.,	M. E.,	Marion,	Linn.
Carr, Marie,	D. E.,	Columbus Jct.,	Louisa.
Chalmers, David,	Vet.,	Corning,	Adams.
Chapman, Evan A.,	Sci.,	Randolph,	*Nebraska.*
Chase, May,	Sci.,	Colorado Springs,	*Colorado.*
Clapper, Lyle,	C. E.,	Ames,	Story.
Clark, Giles W.,	E. E.,	Cedar Rapids,	Linn.
Cockerell, B. Fred,	C. E.,	Harlan,	Shelby.
Compton, W.,	A. H.,	Stuart,	Guthrie.
Conger, Carol,	Sci.,	Adel,	Dallas.
Cooley, Clark H.,	E. E.,	Manchester,	Delaware.
Cooney, Margaret,	D. E.,	West Union,	Fayette.
Cowan, Harley C.,	A. H.,	Eagle Grove,	Wright.
Cramer, Wm. H.,	M. E.,	Reasnor,	Jasper.
Crawford, Arch,	C. E.,	Cherokee,	Cherokee.
Crittenden, Florence,	D. E.,	Humboldt,	Humboldt.
Cupps, Ethel,	Sci.,	Ames,	Story.
Dahlby, I. E.,	A. H.,	Joice,	Worth.
Dake, Nora F.,	D. E.,	Ames,	Story.
Darger, Harry C.,	A. H.,	Sioux City,	Woodbury.
Davenport, Will,	A. H.,	Odebolt,	Sac.
Davis, Chas. W.,	A. H.,	Allison,	Butler.
Davis, Edward C.,	A. H.,	Hedrick	Keokuk.
Davis, Orin L.,	C. E.,	New Virginia,	Warren.
Day, R. M.,	Dairy,	Minneapolis,	*Minnesota.*
Deacon, E. L.,	C. E.,	Ames,	Story.
Deacon, Elizabeth,	Sci.,	Ames,	Story.
Deal, Maud,	D. E.,	Ames,	Story.
Deemer, Edward,	A. H.,	Des Moines,	Polk.
DeVault, C. G.,	M. E.,	Ames,	Story.
Dewey, Wm. A.,	C. E.,	Milford,	Dickinson.
Dickey, Walter N.,	E. E.,	Cedar Falls,	Blackhawk.
Doerr, John,	Vet.,	Baxter,	Jasper.
Dornbach, M. E.,	Ceramics,	McGregor,	Clayton.
Doughty, L. H.,	C. E.,	Norfolk,	*Nebraska.*
Dowson, Harry R.,	M. E.,	Columbus Jct.,	Louisa.
Drury, Wm. T.,	C. E.,	Ames,	Story.
DuVal, Eugene,	M. E.,	Hastings,	Mills.
Eastwold, O. A.,	E. E.,	LeRoy,	*Minnesota.*
Edgecomb, Rex,	C. E.,	Missouri Valley,	Harrison.
Edmonds, Walter E.,	M. E.,	Sioux City,	Woodbury.
Eichling, H. L.,	Agron.,	Paulding,	*Ohio.*
Elayda, Inocenci,	Agron.,	Iba,	*Zambales, P.*
Elliott, W. R.,	Vet.,	Woodward,	Dallas.
Evans, E. Loyd,	M. E.,	Linn Grove,	Buena Vista.
Farnsworth, E. P.,	Dairy,	Avoca,	Pottamattami
Farnsworth, Elizabeth,	D. E.,	Boone,	Clinton.
Fedderson, M. H.,	A. H.,	Bryant,	Boone.

Ferm, John F.,	M. E.,	Lead,	*South Dakota.*
Fiester, Archie,	E. E.,	Independence,	Buchanan.
Fillis, Benj.,	E. E.,	Sutherland,	O'Brien.
Fintel, A. R.,	M. E.,	Ames.	Story.
Fisher, Austin J.,	C. E.,	Glidden,	Carroll.
Fleming, Mable,	Sci.,	Ames,	Story.
Fobes, R. G.,	A. H.,	Marcus,	Cherokee.
Freed, Oscar,	Vet.,	Ames,	Story.
Freeman, Frank G.,	Hort.,	Winfield,	Henry.
Frevert, Carl B.,	M. E.,	Odebolt,	Sac.
Fuller, J. M.,	Agron.,	Ames,	Story.
Gardner, W. Miles,	A. H.,	Audubon,	Audubon.
Gibson, E. P.,	E. E.,	Harlan,	Shelby.
Gilchrist, Margaret,	Sci.,	Boone,	Boone.
Gillespie, Agnes,	D. E.,	Spencer,	Clay.
Gilmore, C. B.,	E. E.,	Phillyis,	*Nebraska.*
Gilmore, Earl A.,	Vet.,	Ames,	Story.
Gilmore, Wayne,	E. E.,	Des Moines,	Polk.
Gobble, Carl F.,	A. H.,	Fairfield,	Jefferson.
Goodin, Chas.,	C. E.,	Des Moines,	Polk.
Goodrich, Ira E.,	C. E.,	Waterloo,	Blackhawk.
Gregg, R. M.,	A. H.,	Hawarden,	Sioux.
Griffith, Bessie,	Sci.,	Ames,	Story.
Haas, Franz J.,	Agron.,	Shelby,	Shelby.
Haberkorn, Julian,	A. H.,	Cherokee,	Cherokee.
Hahn, Edward,	E. E.,	Whittemore,	Kossuth.
Hammond, F. B.,	A. H.,	Ames,	Story.
Handy, Don J.,	Agron.,	Grinnell,	Poweshiek.
Hanson, Bert,	C. E.,	Stacyville,	Mitchell.
Hardman, C. J.,	A. H.,	Commerce,	*Georgia.*
Harris, Merton,	M. E.,	Perry,	Dallas.
Harter, Ira,	M. E.,	Sac City,	Sac.
Hatch, H. C.,	E. E.,	George,	Lyon.
Havner, Harry,	Vet.,	Corydon,	Wayne.
Heiple, Eldredge,	C. E.,	Waterloo,	Blackhawk.
Hill, A. F.,	M. E.,	Ames,	Story.
Hill, Frank W.,	C. E.,	Osage,	Mitchell.
Hintgen, L. N.,	C. E.,	Ashton,	Osceola.
Hise, Fred H.,	M. E.,	Monroe,	Jasper.
Hoffman, Arthur,	Hort.,	Des Moines,	Polk.
Hoffman, Geo. C.,	C. E.,	Livermore,	Humboldt.
Holcombe, F. L.,	A. H.,	Southern Pines,	*North Carolina.*
Holloway, G. N.,	E. E.,	Mason City,	Cerro Gordo.
Horcasitas, Fernando,	Agron.,	Chihuahua,	*Mexico.*
Horton, Guy,	Mn. E.,	Marion,	Linn.
Householder, Harold,	Vet.,	Chariton,	Lucas.
Howd, Otto,	C. E.,	Webster City,	Hamilton.
Howe, John,	A. H.,	Council Bluffs,	Pottawattamie.
Hoyt, Edward,	M. E.,	Omaha,	*Nebraska.*
Hoyt, S. H.,	C. E.,	Mason City,	Cerro Gordo.
Hudson, C. Ross,	E. E.,	Ames,	Story.
Hungerford, Josephine,	Sci.,	Carroll,	Carroll.
Hunt, Edith,	D. E.,	Ackley,	Hardin.
Hurd, R. R.,	C. E.,	Williams,	Hamilton.
Hynes, Bert C.,	E. E.,	Shenandoah,	Page.
Iverson, Wood C.,	A. H.,	Sergeant Bluff,	Woodbury.
Jenson, Gene J.,	E. E.,	Maquoketa,	Jackson.
Johnson, Bernard,	Vet.,	Sweetwater,	*Nebraska.*
Johnson, Oscar J.,	Vet.,	Wheatland,	*Wyoming.*

Jones, Margaret,	D. E.,	Manchester,	Delaware.
Jones, R. G.,	Agron.,	Marion,	Linn.
Kamerer, N. C.,	M. E.,	Fort Madison,	Lee.
Keeney, W. E.,	C. E.,	Jefferson,	Greene.
Kelley, J. B.,	M. E.,	Ames,	Story.
Kendall, Rex W.,	M. E.,	Burlington,	Des Moines.
Ketman, Geo. F.,	C. E.,	Humboldt,	Humboldt.
Kierulff, Karl,	E. E.,	Montezuma,	Poweshiek.
Killey, J. W.,	C. E.,	Geneva,	*Illinois.*
Kingman, Floyd,	Agron.,	Des Moines,	Polk.
Kingsley, Paul N.,	C. E.,	Strawberry Point,	Clayton.
Kinyen, Chas.,	E. E.,	Newton,	Jasper.
Klippel, F. H.,	E. E.,	Britt,	Hancock.
Knox, Ralph,	E. E.,	Marcus,	Cherokee.
Kyner, Roy,	Vet.,	Humeston,	Wayne.
Laing, Frank O.,	E. E.,	Grinnell,	Poweshiek.
Laird, W. R.,	Vet.,	Algona,	Kossuth.
Lake, C. C.,	A. H.,	Gilbert,	Story.
Lamb, Eleanor M.,	D. E.,	Ridott,	*Illinois.*
Lamson, J. B.,	Agron.,	Fairfield,	Jefferson.
LaSourd, G. M.,	M. E.,	Woodbine,	Harrison.
Lattimer, B. J.,	Vet.,	Bancroft,	Kossuth.
Lee, La Verne,	Sci. & Agr.,	Sac City,	Sac.
Leerburg, N.,	M. E.,	Marshalltown,	Marshall.
Lemmon, Geo. R.,	C. E.,	Atlantic,	Cass.
Linse, J. F.,	Vet.,	Ames,	Story.
Long, Geo. J.,	E. E.,	Thornton,	Cerro Gordo.
Lorenzo, Tomas,	M. E.,	San Fernando,	*Pampanga, P. I*
Lovesee, Roscoe G.,	Vet.,	Storm Lake,	Buena Vista.
Luney, E. A.,	E. E.,	Denison,	Crawford.
Macklin, T.,	Dairy,	Ames,	Story.
MacDonald, C. M.,	C. E.,	Montezuma,	Poweshiek.
MacRoberts, Hilton,	Vet.,	Columbus Jct.,	Louisa.
Madsen, Sern,	M. E.,	Ames,	Story.
Madson, Nina,	Sci.,	Ames,	Story.
Maine, Harry E.,	Mn. E.,	Des Moines,	Polk.
Malloy, John M.,	C. E.,	Davenport,	Scott.
Maney, T. J.,	Agr.,	Geneva,	*New York.*
Mann, Floyd D.,	Agron.,	Castana,	Monona.
Mantor, M. Inez Vincent,	D. E.,	Ames,	Story.
Marks, W. H.,	Vet.,	Lake Park,	Dickinson.
Martin, E. R.,	E. E.,	Wayland,	Henry.
Mayhew, Harry,	A. H.,	Villisca,	Montgomery.
Mercer, F. H.,	A. H.,	Elliott,	Montgomery.
Merrill, A. H.,	C. E.,	Livermore,	Humboldt.
Michaelson, Thornwald,	C. E.,	Cedar Falls,	Blackhawk.
Middleton, R. S.,	Dairy,	Minerva,	Marshall.
Miller, Paul,	Agron.,	Cedar Rapids,	Linn.
Miller, R. E.,	C. E.,	Estherville,	Emmet.
Mobley, Byers,	E. E.,	Oskaloosa,	Mahaska.
Moriarty, Clarence,	C. E.,	Redfield,	*South Dakota.*
Morris, F. H.,	M. E.,	Corning,	Adams.
Mosbo, Edward,	M. E.,	Rembrandt,	Buena Vista.
Moses, Rupert,	Agron.,	Oak Park,	*Illinois.*
Mosher, Clark L.,	C. E.,	West Liberty,	Muscatine.
Moss, Verne W.,	E. E.,	Albia,	Monroe.
Musgrove, F. B.,	M. E.,	Ames,	Story.
McCartney, Roy,	M. E.,	Cedar Rapids,	Linn.
McCord, Bradley,	M. E.,	Harlan,	Shelby.

McCormick, A. G.,	A. H.,	Mount Pleasant,	Henry.
McCoy, Edwin,	E. E.,	Creston,	Union.
McCullock, H.,	Vet.,	Humeston,	Wayne.
McCullough, Conde B.,	C. E.,	Fort Dodge,	Webster.
McCune, C. E.,	E. E.,	Davenport,	Scott.
McDonald, Montgomery,	E. E.,	Lamoni,	Decatur.
McDonald, Murle,	Agron.,	Ames,	Story.
McElroy, Margaret,	Sci.,	Newton,	Jasper.
McElyea, Lew W.,	Vet.,	Ames,	Story.
McMillan, J. G.,	Agron.,	Vinton,	Benton.
McMillan, L. E.,	A. H.,	Vinton,	Benton.
Naiden, J. H.,	M. E.,	Woodward,	Dallas.
Narvis, Stewart,	M. E.,	Muscatine,	Muscatine.
Neil, James E.,	Agr.,	Long Grove,	Scott.
Nelson, N. Louis,	Vet.,	Algona,	Kossuth.
Newell, Thomas,	C. E.,	Columbus Jct.,	Louisa.
Nicholson, H. L.,	E. E.,	Belle Plaine,	Benton.
Nielson, Alfred,	Vet.,	Ames,	Story.
Noble, Guy L.,	Hort.,	State Center,	Marshall.
Osborne, W. Howard,	A. H.,	Perry,	Dallas.
Packer, Earle,	Mn. E.,	Bonaparte,	Van Buren.
Palmer, Berte L.,	E. E.,	Algona,	Kossuth.
Palmer, Donald B.,	Vet.,	Cedar Rapids,	Linn.
Palmer, Roy C.,	Agron.,	Eddyville,	Wapello.
Pammel, Harriet,	Sci.,	Ames,	Story.
Parke, L. S.,	Hort.,	Paullina,	O'Brien.
Parker, B. L.,	E. E.,	Moscow,	Muscatine.
Patterson, H. F.,	Agron.,	Burt,	Kossuth.
Paulson, H. J.,	E. E.,	Avoca,	Pottawattamie.
Paxton, Winter,	Vet.,	Ames,	Story.
Pearson, A. F.,	A. H.,	Washington,	Washington.
Peoples, R. A.,	Vet.,	Woodward,	Dallas.
Peterson, Geo. E.,	C. E.,	Harlan,	Shelby.
Platts, Chas.,	Agron.,	Lake Mills,	Winnebago.
Porter, Clyde H.,	Agron.,	Davenport,	Scott.
Porterfield, Ray,	Vet.,	Hartley,	O'Brien.
Pusch, Geo. W.,	M. E.,	Tucson.	*Arizona.*
Quint, Annie,	Sci.,	Des Moines,	Polk.
Raash, F. A.,	E. E.,	Rockford,	Floyd.
Rector, Jno. W.,	A. H.,	Oneida,	Delaware.
Reis, R. B.,	M. E.,	Ames,	Story.
Richardson, R. E.,	C. E.,	Armstrong,	Emmet.
Ricketts, R. A.,	Vet.,	Nevada,	Story.
Robinson, F. A.,	Mn. E.,	Colfax	Jasper.
Rogers, Harold,	C. E.,	Toledo,	Tama.
Rohwer, Alfred,	E. E.,	Denison,	Crawford.
Root, Walter,	C. E.,	Des Moines,	Polk.
Rowat, Dave,	A. H.,	Des Moines,	Polk.
Rudnick, A. W.,	Dairy,	Chicago,	*Illinois.*
Rush, Gladys,	Sci.,	Colfax,	Jasper.
Russell, W. H. C.,	E. E.,	Milton,	Van Buren.
Sauerberg, C. G.,	M. E.,	Mason City,	Cerro Gordo.
Schafer, Chas. W.,	C. E.,	Grinnell,	Poweshiek.
Schmitt, Walter W.,	Agron.,	Niagara Falls,	*New York.*
Schnaidt, H. A.,	A. H.,	Menno,	*South Dakota.*
Schoel, Fred,	C. E.,	Gladbrook,	Tama.
Schoenenberger, J. G.,	Vet.,	East Peru,	Madison.
Schregardus, Dirk,	E. E.,	Prairie City,	Jasper.
Schulte, Louise,	Sci.,	McGregor,	Clayton.

Scott, Floyd A.,	Vet.,	Ontario,	Story.
Schriver, S. A.,	Dairy,	Denison,	Crawford.
Searle, Mary,	Sci.,	Nemaha,	Sac.
Sharp, Glen,	Vet.,	Montezuma,	Poweshiek.
Shields, Fred,	A. H.,	Villisca,	Montgomery.
Shiffer, Jas.,	M. E.,	Tipton,	Cedar.
Simmons, Paul,	C. E.,	Osceola,	Clark.
Simpson, J. Wallace,	Agron.,	Whittemore,	Kossuth.
Slater, Victor,	C. E.,	Ames,	Story.
Smith, Will Allen,	E. E.,	Reinbeck,	Grundy.
Smith, Wm. Armstrong,	C. E.,	Roxbury,	*New York.*
Smith, Warren T.,	C. E.,	Ames,	Story.
Sharp, E. P.,	C. E.,	Dow City,	Crawford.
Spencer, R. L.,	M. E.,	Des Moines,	Polk.
Squyer, A. R.,	M. E.,	Ames.	Story.
Stafford, H. A.,	Agron.,	Blairsburg,	Hamilton.
Stafford, Ray,	E. E.,	Blairsburg,	Hamilton.
Stearns, Harvey,	M. E.,	Sutherland,	O'Brien.
Stephens, Marie,	D. E.,	Lohrville,	Calhoun.
Stewart, B. A.,	Sci. & Agr.,	Marshalltown,	Marshall.
Stewart, Jas. E.,	C. E.,	Eldon,	Jasper.
Stoddard, Irving W.,	C. E.,	Newton,	Jasper.
Stoulil, W. G.,	C. E.,	Pocahontas,	Pocahontas.
Taylor, R. A.,	Mn. E.,	Ruthven,	Palo Alto.
Tellier, Emma,	D. E.,	Humboldt,	Humboldt.
Terrill, M. F.,	Mn. E.,	Winterset,	Madison.
Thomas, Helen M.,	Sci.,	Charles City,	Floyd.
Thomas, Roscoe M.,	M. E.,	North English,	Iowa.
Thompson, J. Irwin,	A. H.,	Jamaica,	Guthrie.
Tolstrup, M. R.,	Dairy,	Ames,	Story.
Tompkins, Willie,	E. E.,	Garrison,	Benton.
Trimble, C. S.,	Dairy,	Alden,	Hardin.
Tyler, H. E.,	M. E.,	Villisca.	Montgomery.
Vail, Howard,	A. H.,	Nevada,	Story.
Van Anken, Ellsworth,	Mn. E.,	Ames,	Story.
Vaughn, Howard,	A. H.,	Marion,	Linn.
Velie, Carlton E.,	E. E.,	Sanborn,	O'Brien.
Vogel, Walter,	C. E.,	Malcom,	Poweshiek.
Vorse, Charles,	C. E.,	Des Moines,	Polk.
Wakefield, Helen,	D. E.,	Sioux City,	Woodbury.
Wakeman, R. P.,	E. E.,	Fort Dodge,	Webster.
Walker, B. A.,	C. E.,	Des Moines,	Polk.
Waterman, C. R.,	E. E.,	Newell,	Buena Vista.
Watson, Wallace,	C. E.,	Greene,	Butler.
Watts, Helen,	D. E.,	Ames,	Story.
Weiss, Albert,	A. H.,	Denison,	Crawford.
Wells, C. J.,	E. E.,	Ireton,	Sioux.
Whitham, J. C.,	Hort.,	Fairfield,	Jefferson.
Whittemore, Ruth,	D. E.,	Sioux City,	Woodbury.
Wichman, Geo.,	E. E.,	Atlantic,	Cass.
Wilbur, Wm. E.,	C. E.,	Omaha,	*Nebraska.*
Wilcox, Herbert,	Hort.,	Marshalltown,	Marshall.
Willett, T. K.,	Mn. E.,	Decorah,	Winneshiek.
Willey, L. E.,	Vet.,	Ames,	Story.
Williams, Geo.,	C. E.,	Fort Dodge,	Webster.
Wilson, Ira D.,	Agron.,	Rockwell City,	Calhoun.
Wilson, Velda J.,	Sci.,	Sigourney,	Keokuk.
Woodman, Arthur,	C. E.,	Russell,	Lucas.
Woody, C. C.,	C. E.,	Newton,	Jasper.

Wright, A. C.,	E. E.,	Adel,	Dallas.
Wright, Chas. E.,	C. E.,	Ames,	Story.
Wylie, Paul E.,	Mn. E.,	Des Moines,	Polk.
Zentmire, D.,	Agr.,	Ames,	Story.
Zentmire, Zelma,	Sci.,	Ames,	Story.

FRESHMEN

NAME	COURSE	TOWN	COUNTY
Adams, David,	C. E.,	Oakes,	*North Dakota.*
Adams, Orrin E.,	E. E.,	Sutherland,	O'Brien.
Ageton, Burt,	M. E.,	Ames,	Story.
Ahlbrecht, Louise,	D. E.,	Tama,	Tama.
Alexander, Cecil,	D. E.,	Ames,	Story.
Alexander, Philip,	C. E.,	Guthrie Center,	Guthrie.
Alline, Cozette,	D. E.,	Fort Dodge,	Webster.
Allinson, Charles,	Agr.,	Hampton,	Franklin.
Ambler, Fahy,	C. E.,	Shenandoah,	Page.
Ames, John,	Agr.,	Conrad,	Grundy.
Ames, John H.,	C. E.,	Des Moines,	Polk.
Anderson, A. G.,	C. E.,	Des Moines,	Polk.
Anderson, G. L.,	Sci.,	Waterloo,	Blackhawk.
Anderson, John,	E. E.,	Sioux City,	Woodbury.
Anderson, Roy,	Vet.,	Ames,	Story.
Andrews, Ross,	Vet.,	Grimes.	Polk.
Apple, Alfred B.,	E. E.,	Rock Rapids,	Lyon.
Arentson, James,	M. E.,	Harlan,	Shelby.
Arthur, Jos. N.,	C. E.,	Spirit Lake,	Dickinson.
Arthur, Roy,	Agr.,	Spirit Lake,	Dickinson.
Askey, Geo. R.,	Agr.,	Red Oak,	Montgomery.
Axtell, Chas. E.,	E. E.,	Ames,	Story.
Ayres, A. Owen,	E. E.,	Sheldon,	O'Brien.
Babcock, Lloyd,	M. E.,	Owasa,	Hardin.
Ballard, F. S.,	Vet.,	Ames.	Story.
Bancroft, John S.,	Agr.,	Mount Carroll,	*Illinois.*
Banks, C. H.,	Vet.,	Ames,	Story.
Barclay, M. S.,	A. H.,	West Liberty,	Muscatine.
Barney, Cullen,	Agr.,	Hampton,	Franklin.
Barr, Mrs. Marian,	D. E.,	Clinton,	Clinton.
Barrett, Ruth D.,	Sci.,	Ames,	Story.
Barrett, R. S.,	Hort.,	Osage,	Mitchell.
Barrick, E. T.,	Agr.,	Sheldon,	O'Brien.
Bartlett, Bessie,	D. E.,	Estherville,	Emmet.
Bash, Henry E.,	Agr.,	Huntington,	*Indiana.*
Bass, Elmer A.,	Agr.,	Emerson,	Mills.
Bass, Howard,	Agr.,	Red Oak,	Montgomery.
Bauer, Frank,	Agr.,	Millersburg,	Iowa.
Baughman, John,	Vet.,	Ames,	Story.
Baumbach, John,	C. E.,	Pleasant Valley,	Scott.
Beach, C. S.,	A. H.,	Lenox,	Taylor.
Beaty, Floyd,	E. E.,	Dana,	Greene.
Beckman, Henry,	C. E.,	Muscatine,	Muscatine.
Beebe, F. W.,	A. H.,	Paullina,	O'Brien.
Beitel, A. H.,	M. E.,	Ames,	Story.
Bell, E. M.,	Agr.,	Wiota,	Cass.
Bell, R. A.,	Agr.,	Sumner,	Bremer.
Belt, Floyd,	M. E.,	Ames,	Story.
Bennett, J. F.,	Vet.,	Randolph,	Fremont.
Besack, Robt.,	C. E.,	Newton,	Jasper.

Bice, Don,	C. E.,	Nevada,	Story.
Bigelow, Herbert,	E. E.,	Waukon,	Allamakee.
Biller, Antoinette,	D. E.,	Hartington,	*Nebraska.*
Biller, Minnie,	D. E.,	Hartington,	*Nebraska.*
Bird, Byron,	C. E.,	Duncombe,	Webster.
Bird, Paul,	Mn. E.,	Ames,	Story.
Bishop, R. B.,	Agr.,	Cobb,	*Wisconsin.*
Blinn, Ray E.,	M. E.,	Glidden,	Carroll.
Blunt, Grover,	C. E.,	West Union,	Fayette.
Boden, F. O.,	C. E.,	Ames,	Story.
Bosman, G. J.,	Agr.,	Kraalkop,	*Transvaal, S. A.*
Bowman, Emory N.,	E. E.,	Chariton,	Lucas.
Boyd, Van,	Vet.,	Ames,	Story.
Boyle, Frank,	C. E.,	Canon City,	*Colorado.*
Brady, Ezra,	Vet.,	Sanborn,	O'Brien.
Brammer, Winifred,	Sci.,	Shenandoah,	Page.
Brant, Will.,	E. E.,	Meriden,	Cherokee.
Brooks, E. C.,	E. E.,	Wiota,	Cass.
Brouhard, Ora J.,	Agr.,	Colo,	Story.
Brown, Arthur,	Agr.,	Jefferson,	Greene.
Brown, Carrie,	D. E.,	Ames,	Story.
Brown, Florence,	Music,	Ames,	Story.
Brown, J. Lloyd,	C. E.,	New Providence,	Hardin.
Brown, Roy G.,	Vet.,	Ames,	Story.
Brumhall, J. H.,	E. E.,	Armstrong,	Emmet.
Buckley, Warren,	Agron.,	Hyland Park,	*Illinois*
Buckman, A. W.,	Ceramics,	Calamus,	Clinton.
Burge, Charles,	A. H.,	Mount Vernon,	Linn.
Burket, LeRoy K.,	E. E.,	Hawarden,	Sioux.
Burright, J. B.,	C. E.,	Gravity,	Taylor.
Byers, Jessamine,	Music,	Colo,	Story.
Bysom, Leslie L.,	E. E.,	Primghar,	O'Brien.
Cairy, Forest,	Vet.,	Algona,	Kossuth.
Caldwell, Florence,	D. E.,	Ames,	Story.
Campbell, Armind,	A. H.,	Lake City,	Calhoun.
Campbell, Arthur L.,	M. E.,	Park Rapids,	*Minnesota.*
Campbell, Donald,	C. E.,	Des Moines,	Polk.
Carpenter, Chas.,	Agr.,	Clear Lake,	Cerro Gordo.
Cassady, E. M.,	A. H.,	Whiting,	Monona.
Cathcart, Chat S.,	Agr.,	Lohrville,	Calhoun.
Chappel, Allen R.,	Agr.,	Des Moines,	Polk.
Chevalier, Mary,	D. E.,	Muscatine,	Muscatine.
Christianson, Chas. H.,	E. E.,	Story City,	Story.
Clark, Faye E.,	Sci.,	Humboldt,	Humboldt.
Clark, Hal,	E. E.,	Sioux City,	Woodbury.
Clark, Robt. J.,	E. E.,	Dakota City,	Humboldt.
Clarkson, Leroy J.,	E. E.,	Albia,	Monroe.
Clemmer, H. F.,	C. E.,	Hampton,	Franklin.
Clyde, Flora H.,	D. E.,	Osage,	Mitchell.
Cody, Earl,	M. E.,	Onawa,	Monona.
Cogswell, Fred P.,	C. E.,	Ames,	Story.
Cole, Will,	E. E.,	Williams,	Hamilton.
Colford, M. L.,	M. E.,	Fort Dodge,	Webster.
Collins, James V.,	E. E.,	Winthrop,	Buchanan.
Colvin, R. C.,	C. E.,	Chariton,	Lucas.
Conlee, Glen,	E. E.,	Lehigh,	Webster.
Connelly, Chas. A.,	Agr.,	West Liberty,	Muscatine.
Cooley, Harry B.,	M. E.,	Chadron,	*Nebraska.*
Corray, Lawrence E.,	C. E.,	Monroe,	Jasper.

Cort, Edwin G.,	A. H.,	Ames,	Story.
Cottrill, Frank,	C. E.,	Ames,	Story.
Coulter, F. M.,	Agr.,	Ames,	Story.
Coverdale, Roy,	Agr.,	Maquoketa,	Jackson.
Coykendall, Alice,	D. E.,	Deadham,	Carroll.
Craft, Ira,	C. E.,	Zearing,	Story.
Crawford, A. J.,	Mn. E.,	Des Moines,	Polk.
Creel, S.,	Agron.,	Chihuahua,	*Mexico.*
Cressler, Merritt,	C. E.,	Scranton,	Greene.
Cronin, Maurice,	Agr.,	Sibley,	Osceola.
Crow, H. O.,	Mn. E.,	Eldon,	Wapello.
Culp, Opal,	D. E.,	Ames,	Story.
Cunning, Harold,	Mn. E.,	Clinton,	Clinton.
Cutler, Ed. C.,	M. E.,	Farragut,	Fremont.
Dale, E. M.,	Agr.,	Blythedale,	*Missouri.*
Daly, Claude C.,	E. E.,	Newton,	Jasper.
Darbyshire, Glen,	A. H.,	Shannon City,	Union.
Davies, Maude H.,	Sci.,	Ames,	Story.
Davis, Elizabeth A.,	Sci.,	Sutherland,	O'Brien.
Dean, Caroline,	D. E.,	Nevada,	Story.
Dean, Fred L.,	E. E.,	Ames,	Story.
Deemer, Elizabeth,	Sci.,	Des Moines,	Polk.
Deischer, Harold,	Agr.,	Monticello,	Jones.
De Kay, Earle,	E. E.,	Ames,	Story.
De Vault, Lois,	D. E.,	Ames,	Story.
Dodds, John S.,	C. E.,	Mankato,	*Minnesota.*
Doggatt, A. E.,	Agr.,	Ames,	Story.
Dorchester, Chas.,	Agr.,	Clear Lake,	Cerro Gordo.
Doty, Hiram,	Sci.,	Ames,	Story.
Doty, Katie,	Sci.,	Ames,	Story.
Doty, Lewis,	Agr.,	Ames,	Story.
Drasda, F.,	E. E.,	Lyons,	Clinton.
Dreibelbis, J. H.,	E. E.,	Ames,	Story.
Drennan, Carrie B.,	Music,	Corning,	Adams.
Drennan, Stella,	Sci.,	Mount Etna,	Adams.
Drew, Paul,	C. E.,	Traer,	Tama.
Dunham, Florence,	D. E.,	Ames,	Story.
Dunlop, A. N.,	Agr.,	Fort Dodge,	Webster.
Dunlop, Geo.,	Agr.,	Jefferson,	Greene.
Dunn, Russell,	Agr.,	Ames,	Story.
Eder, E. O.,	C. E.,	Estherville,	Emmet.
Egloff, J. M.,	Agr.,	Cedar Falls,	Blackhawk.
Eichendorf, W. L.,	C. E.,	McGregor,	Clayton.
Elliott, Frank,	Agr.,	Sioux City,	Woodbury.
Ellis, Wayne P.,	M. E.,	Onawa,	Monona.
Emerson, J. G.,	Sci.,	Burchinal,	Cerro Gordo.
Eroe, Harold,	E. E.,	Walnut,	Pottawattamie.
Fain, Olive E.,	D. E.,	Chariton,	Lucas.
Falkenheimer, Fred,	Agr.,	Dubuque,	Dubuque.
Fedderson, Paul C.,	Mn. E.,	Bryant,	Clinton.
Fegen, John,	M. E.,	Anamosa,	Jones.
Fensler, Harry M.,	C. E.,	Missouri Valley,	Harrison.
Ferrand, Wm. S.,	Vet.,	Ames,	Story.
Ferriols, Vincente,	Vet.,	San Marcentino,	*Zambales, P. I.*
Finch, A. D.,	C. E.,	West Union,	Fayette.
Fischer, Edward L.,	E. E.,	Ames.	Story.
Fishel, H. B.,	C. E.,	Dow City,	Crawford.
Flint, Helen,	D. E.,	Ames,	Story.
Flint, Victor,	Agr.,	Nashua,	Chickasaw.

Folkins, G. H.,	Vet.,	Ames,	Story.
Foster, C. A.,	C. E.,	Ames,	Story.
Fowler, Arthur E., Jr.,	M. E.,	Cedar Rapids,	Linn.
Frances, Leslie L.,	E. E.,	Manson,	Calhoun.
Freed, W. J.,	Agr.,	Ames,	Story.
Friedman, V. N.,	E. E.,	Sioux City,	Woodbury.
Frommelt, Horace,	E. E.,	Dubuque,	Dubuque.
Fuchs, Iva,	D. E.,	Early,	Sac.
Fuchs, O. C.,	A. H.,	Odebolt,	Sac.
Furman, Russel,	C. E.,	Lyons,	Clinton.
Gaden, Henry,	C. E.,	Remsen,	Plymouth.
Gallenkamp, Geo.,	Agr.,	Washington,	*Missouri.*
Garabrant, Howard,	Agr.,	Chester,	*New Jersey.*
Gaston, Mildred,	D. E.,	Boone,	Boone.
Gates, Estes N.,	Agr.,	Newton,	Jasper.
Gaylord R. Welles,	C. E.,	Grinnell,	Poweshiek.
Gibbs, Clarence,	Agr.,	Niter,	*Idaho.*
Gibson, Andrew D.,	E. E.,	Ames,	Story.
Gilles, DeWitt C.,	Vet.,	Stacyville,	Mitchell.
Gillmore, I. F.,	Agr.,	Dixon,	Scott.
Gilsenan, E. J.,	Vet.,	Ames,	Story.
Gjellefald, O.,	E. E.,	Forest City,	Winnebago.
Good, Harry F.,	E. E.,	Ames,	Story.
Graham, Jesse,	C. E.,	Keswick,	Keokuk.
Gratiot, Flint,	M. E.,	Shellsburg,	*Wisconsin.*
Gratiot, Joseph B.,	A. H.,	Shellsburg,	*Wisconsin.*
Gray, Margaret,	D. E.,	Ames,	Story.
Group, Jesse,	E. E.,	Ames,	Story.
Gutekunst, Giffert,	Agr.,	State Center,	Marshall.
Hadley, M. B.,	Mn. E.,	Shelby,	Shelby.
Hale, Virgil,	M. E.,	Carroll,	Carroll.
Hall, Harry W.,	Vet.,	West Liberty,	Muscatine.
Hall, Ora W.,	E. E.,	Ames,	Story.
Hamilton, Geo.,	Agron.,	Douglass,	*Wyoming.*
Hamilton, L. S.,	E. E.,	Central City,	Linn.
Hamilton, Sherman,	M. E.,	Lead,	*South Dakota.*
Hampton, Maggie,	D. E.,	Coon Rapids,	Carroll.
Hanchette, Ralph,	C. E.,	Sioux City,	Woodbury.
Hancock, Mabel,	D. E.,	Clarion,	Wright.
Hanna, H. E.,	Agron.,	Manchester,	Delaware.
Hansell, Hortense,	Sci.,	Ottumwa,	Wapello.
Hanson, Soren,	Vet.,	Ames,	Story.
Hanson, Irvin,	E. E.,	Estherville,	Emmet.
Hardy, Elmer L.,	E. E.,	Norfolk,	*Nebraska.*
Harper, Fred,	M. E.,	Cedar Rapids,	Linn.
Harris, Fred,	E. E.,	Des Moines,	Polk.
Hartnell, Fred,	Agr.,	Stacyville,	Mitchell.
Hartung, A. E.,	E. E.,	Estherville,	Emmet.
Hassell, Claire,	Agr.,	Cedar Rapids,	Linn.
Hatch, Frank E.,	A. H.,	Sumner,	Bremer.
Hathaway, Ina,	D. E.,	Webster City,	Hamilton.
Haw, A. B.,	E. E.,	Ottumwa,	Wapello.
Hawthorne, H. B.,	Agr.,	Castana,	Monona.
Helm, Ralph,	Agron.,	Des Moines,	Polk.
Hendricks, C. W.,	Agron.,	Muscatine,	Muscatine.
Hess, A. W.,	Mn. E.,	Lyons,	Clinton.
Hill, F. A.,	M. E.,	Rectory,	*Virginia.*
Hill, John T.,	Sci.,	Cambridge,	Story.
Hitchings, Chas.,	Agr.,	Sutherland,	O'Brien.

Hites, Edwin,	Vet.,	Des Moines,	Polk.
Hook, M. Glenn,	M. E.,	Humboldt,	Humboldt.
Hoopes, Amy,	Music,	Muscatine,	Muscatine.
Hopkins, Lynn,	E. E.,	Villisca,	Montgomery.
Horcasitas, P.,	Agr.,	Chihuahua,	*Mexico.*
Horn, Walter L.,	Agr.,	Newton,	Jasper.
Hoskins, G. G.,	E. E.,	Pacific Junction,	Mills.
Hough, Herbert S.,	Agr.,	Chicago,	*Illinois.*
Howard, Allen B.,	M. E.,	Fort Madison,	Lee.
Howard, Alva L.,	Vet.,	Ames,	Story.
Howe, Alice R.,	D. E.,	Cedar Rapids,	Linn.
Hunter, Carrie,	D. E.,	Ames,	Story.
Hurst, R. L.,	Mn. E.,	Leon,	Decatur.
Hutcheson, C. R.,	Dairy,	West Branch,	Cedar.
Hutchison, W. E.,	C. E.,	Dawson,	Dallas.
Jackson, Cecil E.,	Vet.,	Kellerton,	Ringgold.
Jeffrey, John,	E. E.,	Ames,	Story.
Johnson, Floyd L.,	A. H.,	Boone,	Boone.
Johnson, Frank B.,	E. E.,	Wall Lake,	Sac.
Johnson, Isaac B.,	C. E.,	Humboldt,	Humboldt.
Johnson, Josephine,	D. E.,	Sioux City,	Woodbury.
Jones, J. J.,	Mn. E.,	Ida Grove,	Ida.
Jones, Marion E.,	Agr.,	Hamlin,	Audubon.
Jones, Will E.,	C. E.,	Sturgis,	*South Dakota.*
Keipp, Harry M.,	Agr.,	Colfax,	Jasper.
Kelleher, John J.,	Agr.,	Des Moines,	Polk.
Kelly, P. F.,	Vet.,	Nevada,	Story.
Kelty, Wm. A.,	Vet.,	Toledo,	Tama.
Kennedy, C. N.,	Agr.,	Ankeny,	Polk.
Kerrigan, John C.,	C. E.,	Davenport,	Scott.
King, Jessie B.,	D. E.,	Pueblo,	*Colorado.*
King, Ruth E.,	Sci.,	Ames,	Story.
Kintsley, Geo.,	Vet.,	Ames,	Story.
Kirk, I. M.,	E. E.,	Corydon,	Wayne.
Kleis, C. E.,	C. E.,	Dubuque,	Dubuque.
Klindt, Rudolph,	C. E.,	Montezuma,	Poweshiek.
Knickerbocker, Jas.,	Agr.,	Radcliffe,	Hardin.
Knight, Everett,	E. E.,	Eldon,	Wapello.
Knutz, Will,	E. E.,	Moville,	Woodbury.
Koepke, W. C.,	A. H.,	Davenport,	Scott.
Koolish, Phillip H.,	E. E.,	Sioux City,	Woodbury.
Kopold, C.,	E. E.,	Dubuque,	Dubuque.
Krause, Franz F. E.,	Agr.,	Ionia,	Chickasaw.
Kuempel, Reuben,	M .E,.	Guttenburg,	Clayton.
Laird, Ralph J.,	Vet.,	Algona,	Kossuth.
Lake, Carrie,	D. E.,	Gilbert,	Story.
Lamson, Leon,	Agr.,	Rensselair,	*Indiana.*
Lardner, Edward,	Vet.,	Penryn,	*California.*
Layman, Claude C.,	Agr.,	Ames,	Story.
Lessel, Leonard,	Agr.,	Perry,	Dallas.
Leiser, Harold,	E. E.,	Alden,	Hardin.
Lindaman, Harvey,	E. E.,	Charles City,	Floyd.
Lippencott, W. A.,	A. H.,	Ames,	Story.
Little, Roy,	Agr.,	Cherokee,	Cherokee.
Livingstone, T. M.,	E. E.,	Monroe,	Jasper.
Logan, Clifton,	Vet.,	Hillsboro,	Henry.
Long, Fred R.,	Agr.,	Marne,	Cass.
Loomis, Geo. A.,	Mn. E.,	Fort Dodge,	Webster.
Louck, Rex,	Vet.,	Kalona,	Washington.

Ludgate, Frank,	Vet.,	Fort Dodge,	Webster.
Luithley, Wm.,	Vet.,	Ames,	Story.
Lynch, Ruby,	Sci.,	Ames,	Story.
Lynde, Alice,	D. E.,	Hartington,	*Nebraska.*
MacGowan, Alice,	Sci.,	Ottumwa,	Wapello.
Macombe, R. L.,	Agr.,	Paullina,	O'Brien.
Manantore, Gregorio,	Agr.,	Arrayo,	*Porto Rico.*
Mann, Karl L.,	M. E.,	Brighton,	Washington.
Mann, W. G.,	E. E.,	Lake Benton,	*Minnesota.*
Manning, H. B.,	A. H.,	Ames,	Story.
Manning, M. M.,	Sci.,	Ames,	Story.
Manning, T. W.,	Sci.,	Ames,	Story.
Marshall, C. T.,	Agr.,	Charter Oak,	Crawford.
Martinson, Wm.,	C. E.,	Harlan,	Shelby.
Marvick, Severt,	Agr.,	Story City,	Story.
Mason, E. E.,	Vet.,	Gilmore City,	Pocahontas.
Mason, Wm. T.,	A. H.,	Iowa Falls,	Hardin.
Masteller, Howard,	Vet.,	Lacey,	Mahaska.
Mayne, Earl W.,	Vet.,	Sanborn,	O'Brien.
Mead, Rex,	E. E.,	Gaza,	O'Brien.
Meentz, Richard O.,	M. E.,	Battle Creek,	Ida.
Melberg, Amos,	C. E.,	Norway,	Benton.
Mendoza, J. P.,	Agr.,	Buenos Aires,	*Paraguay, S. A.*
Mercer, Clyde,	E. E.,	Greenfield,	Adair.
Meltzer, Wm.,	Agr.,	Ames,	Story.
Merrill, E. W.,	Agr.,	Rock Rapids,	Lyon.
Merritt, Ben,	C. E.,	Fort Dodge,	Webster.
Messinger, Arthur,	C. E.,	Fonda,	Pocahontas.
Miller, Claude C.,	E. E.,	Renwick,	Humboldt.
Miller, G. E.,	Agr.,	Iowa City,	Johnson.
Miller, W. J.,	Vet.,	Ames,	Story.
Mills, Vera,	Sci.,	Jefferson,	Greene.
Miner, Leland,	M. E.,	Shell Rock,	Butler.
Minkler, Warren,	E. E.,	Ames,	Story.
Molesberry, Howard C.,	C. E.,	Plymouth,	Cerro Gordo.
Molstad, Julia,	Music,	Moville,	Woodbury.
Montillon, Geo. H.,	M. E.,	Cedar Rapids,	Linn.
Moore, C. G.,	Vet.,	Ames,	Story.
Moore, Elnathon J.,	C. E.,	Cedar Rapids,	Linn.
Moore, Samuel,	A. H.,	Moulton,	Appanoose.
Moorehead, Helen,	D. E.,	Ida Grove,	Ida.
Moran, Raymond,	Agr.,	Clinton,	Clinton.
Motz, Glen,	E. E.,	Guthrie Center,	Guthrie.
Mould, Henry E.,	E. E.,	Sioux City,	Woodbury.
Murray, Chas.,	Vet.,	Ames,	Story.
Myer, Carlton H.,	M. E.,	West Liberty,	Muscatine.
Myers, Delbert F.,	Vet.,	Greenfield,	Adair.
McClurkin, Elizabeth,	D. E.,	Morning Sun,	Louisa.
McCown, W. V.,	C. E.,	Spencer,	Clay.
McCurdy, R. E.,	C. E.,	Ada,	*South Dakota.*
McDermott, Guy,	M. E.,	Anita,	Cass.
McDonough, Dan,	E. E.,	Osceola,	Clark.
McElroy, Harold W.,	Agr.,	Newton,	Jasper.
McGavern, Ward,	M. E.,	Missouri Valley,	Harrison.
McGrew, Melvin,	Agr.,	Emerson,	Mills.
McKim, B. B.,	C. E.,	Deloit,	Crawford.
McKim, F. A.,	Vet.,	Ames,	Story.
McKitterick, R. N.,	M. E.,	Burlington,	Des Moines.
McNair, Albert,	Agr.,	Bovina Center,	*New York.*

McWilliams, C. O.,	E. E.,	Sioux City,	Woodbury.
Nason, Everett,	E. E.,	LeRoy,	*Minnesota.*
Naylor, Joe,	Agr.,	Clear Lake,	Cerro Gordo.
Negaard, Oscar,	M. E.,	Canby,	*Minnesota.*
Nemmers, W. P.,	C. E.,	Bancroft,	Kossuth.
Newburger, M. B.,	Agr.,	Saint Joseph,	*Missouri.*
Newman, John,	A. H.,	Des Moines,	Polk.
Newsome, Fred W.,	Agr.,	Derby,	Lucas.
Nichols, Niva,	Music,	Ames,	Story.
Nichols, Theo.,	Agr.,	Atlantic,	Cass.
Nordstrum, Harry,	Agr.,	Humboldt,	Humboldt.
Norton, Ray A.,	M. E.,	Holstein,	Ida.
O'Bannion, Allen,	Agr.,	Storm Lake,	Buena Vista.
Olmstead, H. H.,	Vet.,	New Hampton,	Chickasaw.
Olmstead, Ralph A.,	Agr.,	Des Moines,	Polk.
Olsen, Carl,	M. E.,	Red Oak,	Montgomery.
Olson, DeWitt P.,	C. E.,	Sac City,	Sac.
Olson, G. Chris,	C. E.,	Ellsworth,	Hamilton.
Olson, James,	C. E.,	Williams,	Hamilton.
Olson, Wm. A.,	C. E.,	Cambridge,	Story.
O'Neil, Clem,	A. H.,	Livermore,	Humboldt.
Packman, Chloe,	Sci.,	Eagle Grove,	Wright.
Paine, Harry,	Vet.,	Algona,	Kossuth.
Paine, Henry W.,	M. E.,	Eagle Grove,	Wright.
Palm, Ernest W.,	E. E.,	Des Moines,	Polk.
Palmer, E. M.,	C. E.,	Mason City,	Cerro Gordo.
Parmenter, Glee,	Vet.,	Grimes,	Polk.
Patterson, John,	Vet.,	Marion,	Linn.
Paulson, Aug.,	C. E.,	Irwin,	Shelby.
Peshak, Leona,	Sci.,	Osage,	Mitchell.
Peterson, Joe A.,	C. E.,	Estherville,	Emmet.
Pfaff, Otto,	M. E.,	Sioux City,	Woodbury.
Pfund, Hans John C.,	C. E.,	Des Moines,	Polk.
Phillips, Claude A.,	C. E.,	Des Moines,	Polk.
Pickler, Herbert T.,	Vet.,	Ottumwa,	Wapello.
Pollock, Roscoe C.,	Sci.,	Martinsburg,	Keokuk.
Pomeroy, Loren,	C. E.,	Newton,	Jasper.
Porter, D. G.,	M. E.,	Davenport,	Scott.
Powers, Robt. E.,	Agr.,	Sanborn,	O'Brien.
Pulver, C. W.,	C. E.,	Ames,	Story.
Quaife, Elvin L.,	Agr.,	Ionia,	Chickasaw.
Quinn, Allen W.,	Agr.,	Mantua,	*Ohio.*
Quinn, Jas. F.,	E. E.,	Grand Mound,	Clinton.
Randolph, Anita,	D. E.,	Tama,	Tama.
Randolph, Gail,	D. E.,	Tama,	Tama.
Rankin, W. M.,	Agr.,	Tarkio,	*Missouri.*
Reed, Clark L.,	A. H.,	Bradford,	*Illinois.*
Reel, Russell,	E. E.,	Des Moines,	Polk.
Reeves, Esther,	D. E.,	Sibley,	Osceola.
Richardson, C. R.,	Agr.,	Oak Park,	*Illinois.*
Richardson, Mary,	D. E.,	Maquoketa,	Jackson.
Richmond, Chas. A.,	E. E.,	Cedar Rapids,	Linn.
Richmond, Howard,	Agr.,	West Union,	Fayette.
Richmond, R. R.,	A. H.,	Bancroft,	Kossuth.
Ries, Sabin,	Vet.,	Armstrong,	Emmet.
Rietveld, Harriet,	D. E.,	Pella,	Marion.
Roberts, L. L.,	Vet.,	Zearing,	Story.
Robinson, Clara,	D. E.,	Armstrong,	Emmet.
Rogers, Glen E.,	Agr.,	Alexis,	*Illinois.*

Rosencrans, Merle,	C. E.,	Canton,	*South Dakota.*
Ross, C. W.,	Vet.,	Onawa,	Monona.
Rounds, Arvin D.,	C. E.,	Rock Valley,	Sioux.
Rowat, Thos.,	C. E.,	Des Moines,	Polk.
Ruppel, Leona,	Sci.,	Webster City,	Hamilton.
Rush, F. Fern,	D. E.,	Ames,	Story.
Rutledge, Reyburn,	Agr.,	Fort Dodge,	Webster.
Sanborn, G. C.,	Mn. E.,	Moville,	Woodbury.
Schaal, Robt. B.,	E. E.,	Polk City,	Polk.
Scholer, Theo. M.,	C. E.,	Sioux Rapids,	Buena Vista.
Schott, Ella,	D. E.,	What Cheer,	Keokuk.
Schumacher, Chas. H.,	M. E.,	Clarion	Wright.
Schworm, Eloise,	Sci.,	Nevada,	Story.
Scott, Harry,	Agr.,	Corning,	Adams.
Scott, Roy,	E. E.,	Onawa,	Monona.
Searle, Jessie,	Hort.,	Nemaha,	Sac.
Seymour, Henrietta,	D. E.,	Ottumwa,	Wapello.
Shanley, Adrian,	E. E.,	Ames,	Story.
Shaw, Don B.,	Mn. E.,	Monroe,	Jasper.
Shear, Clyde,	E. E.,	State Center,	Marshall.
Shearer, Phineas,	Agr.,	Marshalltown,	Marshall.
Sheehan, Gertrude,	D. E.,	Osage,	Mitchell.
Sheehan, Matthew, Wm.,	E. E.,	Des Moines,	Polk.
Shields, Robert,	C. E.,	Washington,	Washington.
Shrader, Ted,	E. E.,	Des Moines,	Polk.
Sibert, Vera,	Music,	Waterloo,	Blackhawk.
Sidenstucker, Bessie,	Music,	Jewell,	Hamilton.
Simmons, Gay,	Vet.,	Ames,	Story.
Simms, W. H.,	Agr.,	Beaman,	Grundy.
Skegg, Ella C.,	D. E.,	Marshalltown,	Marshall.
Skellie, R. E.,	C. E.,	Larrabee,	Cherokee.
Smith, A. Lee,	Agr.,	Creston,	Union.
Smith, Fae E.,	E. E.,	Ames,	Story.
Smith, Howard,	Agr.,	Whiting,	Monona.
Smith, Russell A.,	C. E.,	Storm Lake,	Buena Vista.
Smullen, George,	E. E.,	Clinton,	Clinton.
Snow, H. A.,	E. E.,	Blakesburg,	Wapello.
Sosa, Hermes A.,	Agr.,	Belle Vista,	*Paraguay. S. A.*
Sperry, Donn,	Vet.,	Fayette,	Fayette.
Spurrier, Paul,	C. E.,	Mount Ayr,	Ringgold.
Stang, Levi C.,	E. E.,	LeMars,	Plymouth.
Starman, Rudolph,	Agr.,	Quincy,	*Illinois.*
Stauffer, Madeline,	D. E.,	Eldora,	Wapello.
Steen, Clara,	D. E.,	West Liberty,	Muscatine.
Steigleder, Chas. J.,	C. E.,	Spencer,	Clay.
Stephenson, J. L.,	C. E.,	Spencer,	Clay.
Stirling, G. C.,	M. E.,	Des Moines,	Polk.
St. John, Stella,	Sci.,	Ames,	Story.
Stoddard, Van,	M. E.,	Humboldt,	Humboldt.
Stone, Dudley,	Vet.,	Vinton,	Benton.
Stookey, D. D.,	A. H.,	Cedar Rapids,	Linn.
Storm, Shirley,	D. E.,	Ames,	Story.
Storm, Van M.,	Agr.,	Rockwell City,	Calhoun.
Stott, Earl R.,	M. E.,	Mason City,	Cerro Gordo.
Stott, L. N.,	E. E.,	Mason City,	Cerro Gordo.
Stott, R. O.,	E. E.,	Mason City,	Cerro Gordo.
Strever, H. W.,	C. E.,	Larrabee,	Cherokee.
Strickler, Carl E.,	Sci.,	Sibley,	Osceola.
Stuart, Hoadley,	C. E.,	Glidden,	Carroll.

Stuntz, Harold R.,	Agr.,	Greene,	Butler.
Sutherland, Lewis,	C. E.,	Scotch Grove,	Jones.
Swanson, Arthur,	Vet.,	Webster City,	Hamilton.
Taylor, B. L.,	C. E.,	Ames,	Story.
Taylor, Lee,	Mn. E.,	Maquoketa,	Jackson.
Templeton, W. J.,	E. E.,	Sioux City,	Woodbury.
Thomas, W. Lynk,	C. E.,	Coon Rapids,	Carroll.
Thompson, D. C.,	M. E.,	Marcus,	Cherokee.
Thornburg, E. R.,	E. E.,	Linden,	Dallas.
Thornton, F. B.,	E. E.,	Pocahontas,	Pocahontas.
Tompkin, Lester,	Agr.,	Garrison,	Benton.
Tong, Boyd,	Mn. E.,	Ames,	Story.
Tong, Edna,	D. E.,	Ames,	Story.
Troeger, Paul C.,	Agr.,	Storm Lake,	Buena Vista.
Tuller, Ralph,	Agr.,	Postville,	Allamakee.
Tupper, F. E.,	Vet.,	Springfield,	*South Dakota.*
Tyson, Harry B.,	Mn. E.,	Emmetsburg,	Emmet.
Vader, Leo C.,	C. E.,	Pocahontas,	Pocahontas.
Vallejos, E. E.,	Agr.,	Paraguay,	*South America.*
Van Deventer, J. R.,	A. H.,	Hedrick,	Keokuk.
Van Diepen, Jake,	E. E.,	Boyden,	Sioux.
Van Meerten, E. J.,	Agr.,	Pretoria,	*Transvaal, S. A.*
Vetter, Maude,	D. E.,	Red Oak,	Montgomery.
Vincent, Clarice,	Sci.,	Ames,	Story.
Vincent, R. T.,	M. E.,	Shenandoah,	Page.
Vincent, Terence,	Sci.,	Gerard,	*Kansas.*
Wagner, Kenneth,	C. E.,	Cedar Rapids,	Linn.
Wales, Fred H.,	E. E.,	Monticello,	Jones.
Walker, R. K.,	Agr.,	Des Moines,	Polk.
Walkey, Fred L.,	Vet.,	Ames,	Story.
Wall, Joe F.,	Vet.,	Berwick,	Polk.
Walls, Mildred,	Sci.,	Clinton,	Clinton.
Walraven, John,	E. E.,	Lyons,	Clinton.
Walton, S. F.,	Mn. E.,	Washington,	Washington.
Weaver, Ethel Mae,	D. E.,	Spencer,	Clay.
Webster, Clarence,	E. E.,	Eagle Grove,	Wright.
Webster, Hugh,	Agr.,	Weatherford,	*Oklahoma.*
Welden, Ernest Z.,	C. E.,	Iowa Falls,	Hardin.
Weller, Edward,	E. E.,	Waterloo,	Blackhawk.
Welty, Donald C.,	Agr.,	Chicago,	*Illinois.*
Wendt, Wm. C. R.,	C. E.,	Newton,	Jasper.
Wennholz, Emma S.,	Sci.,	Dundee,	*Illinois.*
Wentch, Margaret,	Sci.,	Dows,	Wright.
Wentsel, Claude,	Agr.,	Beaman,	Grundy.
Westfall, Vere,	E. E.,	Ames,	Story.
Weston, Boyd,	E. E.,	Ames,	Story.
Wheatley, Chas. W.,	E. E.,	Hillsboro,	Henry.
Whitaker, D. G.,	Agr.,	Hillsboro,	Henry.
Whitaker, W. S.,	E. E.,	Hillsboro,	Henry.
White, Helen,	D. E.,	Marion,	Linn.
White, Warren G.,	C. E.,	Nevada,	Story.
Whitehead, Herbert H.,	Agr.,	LaGrange,	*Illinois.*
Whitehouse, Isaac,	E. E.,	Cherokee,	Cherokee.
Whitney, Roy,	Agr.,	Hampton,	Franklin.
Wilder, Frost,	E. E.,	Austin,	*Minnesota.*
Wilkinson, H. Arthur,	E. E.,	Ames,	Story.
Williams, Clarence M.,	Agr.,	Las Vegas,	*New Mexico.*
Williams, Hewitt,	Agr.,	Postville,	Allamakee.
Williams, Ruth,	D. E.,	Fort Dodge,	Webster.

Wilson, Benj.,	Sci. & Agr.,	Spencer,	Clay.
Wilson, Chas. P.,	Mn. E.,	Ames,	Story.
Wilson, Foster W.,	Agr.,	Rockwell City,	Calhoun.
Wilson, Harry,	Agr.,	Malvern,	Mills.
Wilson, Maude,	Sci.,	Sac City,	Sac.
Wilson, R. D.,	E. E.,	Hull,	Sioux.
Winchell, Ira,	M. E.,	Anita,	Cass.
Wolfe, John,	E. E.,	Keokuk	Lee.
Wood, Mrs. Mayme,	Music,	Ames,	Story.
Wormley, Don S.,	E. E.,	Newton,	Jasper.
Wright, Harry F.,	Mn. E.,	Ames,	Story.
Wright, Jack,	Vet.,	Nephi,	*Utah.*
Youngdale, Martin,	Agr.,	Harcourt,	Webster.

ACADEMIC

NAME	COURSE	TOWN	COUNTY
Adams, William,	Agr.,	Little Sioux,	Harrison.
Allyn, Clint,	Agr.,	Mount Ayr,	Ringgold.
Anderson, Florence,	D. E.,	Armstrong,	Emmet.
Anderson, Merle,	Agr.,	Jewell Junction,	Hamilton.
Andre, Edward,	E. E.,	Mechanicsville,	Cedar.
Anthony, Fred H.,	C. E.,	Camache,	Clinton.
Archer, Gladys,	D. E.,	Sheldon,	O'Brien.
Arnold, Edward B.,	Agr.,	Creston,	Union.
Arthand, Ammie,	Sci.,	Chillicothe,	*Missouri.*
Arthand, Delbert,	Agr.,	Chillicothe,	*Missouri.*
Arthur, Edna,	Sci.,	Spirit Lake,	Dickinson.
Ashby, H. P.,	Agron.,	Creston,	Union.
Bacon, Frank R.,	Agr.,	Wilton,	Muscatine.
Baird, Will,	C. E.,	North English.	Iowa.
Baker, Jason,	E. E.,	Whiting,	Monona.
Baldwin, Earl M.,	C. E.,	Creston,	Union.
Ball, Verne E.,	Agr.,	Hawarden,	Sioux.
Banks, Pearl,	D. E.,	Ames,	Story.
Bare, Benj. R.,	E. E.,	Des Moines,	Polk.
Bark, Margaret Ethel,	D. E.,	Sutherland,	O'Brien.
Barker, W. Earl,	C. E.,	Anamosa,	Jones.
Barr, Guy,	E. E.,	Marble Rock,	Floyd.
Batie, Harrison G.,	C. E.,	Ruthven,	Palo Alto.
Bauder, Ernest,	M. E.,	Elgin,	Fayette.
Bauge, J. S.,	Agr.,	Ames,	Story.
Beattie, C. Stewart,	Agr.,	Stuart,	Guthrie.
Beeler, Chas. F.,	Mn. E.,	Ames,	Story.
Berry, Beaufort,	Agr.,	Callender,	Webster.
Best, Geo. W.,	Agr.,	Clinton,	Clinton.
Bigelow, Clarence,	E. E.,	Valley Junction,	Polk.
Bird, Catherine,	Sci.,	Marcus,	Cherokee.
Bird, Otto,	Sci.,	Nashua,	Chickasaw.
Blanchard, F. F.,	A. H.,	Albion,	Marshall.
Bogert, Theo.,	Agr.,	Evanston,	*Illinois.*
Bonner, Roy A.,	Agr.,	Jewell Junction,	Hamilton.
Bonsteel, M.,	M. E.,	Gladbrook,	Tama.
Booth, Lester,	M. E.,	Bonaparte,	Van Buren.
Bornholdt, Newton,	M. E.,	Davenport,	Scott.
Bossert, H. Burdette,	Sci.,	Primghar,	O'Brien.
Bouck, Damon I.,	E. E.,	Royalton,	*Minnesota.*
Bouricius, G. J.,	E. E.,	Council Bluffs,	Pottawattamie.
Bousquet, Ray,	C. E.,	Pella,	Marion.

Bouton, E. M.,	M. E.,	Royal,	Clay.
Boyce, S. H.,	M. E.,	Cedar Rapids,	Linn.
Bradford, Ernest B.,	M. E.,	Ames,	Story.
Bragg, Earl,	M. E.,	Scranton,	Greene.
Brown, Ralph,	Agr.,	Jefferson,	Greene.
Browne, H. L.,	Agr.,	Indianola,	Warren.
Brugger, G. A.,	Agr.,	Lake City,	Calhoun.
Buck, Nathanial,	C. E.,	Oxford,	Johnson.
Buckton, Lura,	D. E.,	Ames,	Story.
Burnett, L. E.,	A. H.,	Clinton,	Clinton.
Burnham, Clarence,	C. E.,	West Union,	Fayette.
Bushnell, Archie,	E. E.,	Algona,	Kossuth.
Butler, Lyle A.,	E. E.,	New Providence,	Hardin.
Carey, Edward,	M. E.,	Ames,	Story.
Casey, F. E.,	Agr.,	Mason City,	Cerro Gordo.
Chambers, John E.,	Agr.,	Omaha,	*Nebraska.*
Clemons, Fred L.,	Agr.,	Clemons,	Marshall.
Colman, Glen M.,	Agr.,	Ames,	Story.
Conlee, Harold E.,	E. E.,	Lehigh,	Webster.
Cooper, Morton,	Agr.,	Knierim,	Calhoun.
Costigan, L. G.,	E. E.,	Pacific Junction,	Mills.
Covey, Ellis E.,	M. E.,	Burlington,	Des Moines.
Crane, Charley,	Agr.,	Central City,	Linn.
Cronin, Leo,	Agr.,	Sibley,	Osceola.
Currier, Harold,	Agr.,	Salix,	Woodbury.
Dalbey, D. E.,	M. E.,	Cedar Rapids,	Linn.
Darbeyshire, Ray,	Agr.,	Shannon City,	Union.
Davenport, Nell,	D. E.,	Odebolt,	Sac.
Davis, Gomer C.,	E. E.,	Linn Grove,	Buena Vista.
Davis, Lizzie,	Sci.,	Bentonsport,	Van Buren.
Deakin, Helen,	Sci.,	Ames,	Story.
Dean, Myrtle,	D. E.,	Clear Lake,	*Wisconsin.*
Decker, Harry J.,	Sci.,	Clarence,	Cedar.
Dodd, Leslie R.,	Agr.,	Moville,	Woodbury.
Dodge, W. A.,	C. E.,	Des Moines,	Polk.
Drake, Wm.,	M. E.,	Ames,	Story.
Drebert, Kimball,	C. E.,	Norfolk,	*Nebraska.*
Dryden, Dee Fern,	D. E.,	Council Bluffs,	Pottawattamie.
Duncan, Harland,	Agr.,	Alexis,	*Illinois.*
Dunning, Mildred,	D. E.,	Ames,	Story.
Dyball, E. P.,	Agr.,	Seymour,	Wayne.
Dyer, Winthrop,	Agr.,	Nevada,	Story.
Easton, Locke,	M. E.,	Garner,	Hancock.
Elliott, Robt. C.,	E. E.,	Lewis,	Cass.
Ellis, Guy,	Agr.,	Swea City,	Kossuth.
Ensminger, Henry N.,	E. E.,	Gilman,	Marshall.
Fagan, H. J.,	E. E.,	Mount Auburn,	Benton.
Fallart, Walter,	E. E.,	Burlington,	Des Moines.
Ferguson, Howard C.,	Agr.,	Mechanicsville,	Cedar.
Feuling, L. V.,	Agr.,	Ames,	Story.
Fick, Adolph,	C. E.,	Boone,	Boone.
Fitzgerald, Joe,	E. E.,	Manson,	Calhoun.
Ford, L. M.,	M. E.,	Cedar Rapids,	Linn.
Foster, Harry,	E. E.,	Scranton,	Greene.
Fowler, Albert,	Sci.,	Ames,	Story.
Fryer, Roy,	Agr.,	Villisca	Montgomery.
Fuller, Ole,	E. E.,	Linn Grove,	Buena Vista.
Fulton, Robt.,	Agr.,	Storm Lake,	Buena Vista.
Gelvin, Ernest,	Agr.,	Maitland,	*Missouri.*

Giese, Henry,	E. E.,	Danville.	Des Moines.
Gillette, Lester,	Agr.,	Fostoria.	Clay.
Gillie, James,	Agr.,	Ames.	Story.
Gogerty, R. A.,	Agr.,	Zearing	Story.
Gousself, Vladimer,	Agr.,	Des Moines,	Polk.
Graves, Leona,	D. E.,	Ames.	Story.
Greene, Harold,	Agr.,	Scranton,	Greene.
Gregg, Ralph W.,	Agr.,	Hawarden.	Sioux.
Griffith, Ben H.,	M. E.,	Anamosa.	Jones.
Griffith, Guy,	E. E.,	Ames.	Story.
Hall, Ben H.,	C. E.,	Rolfe.	Pocahontas.
Halverson, H.,	C. E.,	Kingsley,	Plymouth.
Hammons, Howard,	Agr.,	Lorimor.	Union.
Hanson, Clara,	D. E.,	Glidden.	Carroll.
Hanson, Marie,	D. E.,	Glidden.	Carroll.
Hardin, Max.	Sci.,	Ames.	Story.
Harmon, Guy,	Agr.,	Waterloo.	Blackhawk.
Harrington, Percy,	E. E.,	Westfield,	Plymouth.
Harte, E. C.,	M. E.,	Omaha.	*Nebraska.*
Hasbrouck, Sheila,	Sci.,	Humeston,	Wayne.
Hiersche, Earle,	Agr.,	Early,	Sac.
Hines, Ellsworth,	E. E.,	Milo,	Warren.
Hoff, Carl R.,	C. E.,	Grimes,	Polk.
Holmes, Edwin,	Agr.,	Whiting,	Monona.
Hoover, Max,	Hort.,	Boone.	Boone.
Horn, Chas.,	Agr.,	Mount Ayr,	Ringgold.
Horton, Floyd,	Agr.,	Ames,	Story.
Howard, Willis E.,	E. E.,	Des Moines,	Polk.
Howland, Paul R.,	E. E.,	Melbourne,	Marshall.
Hubbard, Dwight,	M. E.,	Adel,	Dallas.
Hundling, Herman,	E. E.,	Breda,	Carroll.
Huston, Hazel,	D. E.,	Winfield,	Henry.
Hutchinson, Clarion,	E. E.,	DeSoto,	Dallas.
Hyzer, Albert,	Agr.,	Storm Lake,	Buena Vista.
Illeman, John,	C. E.,	Charlotte,	Clinton.
Isakson, A. E.,	E. E.,	Canton,	*South Dakota.*
Jackway, Carl,	E. E.,	Aurora,	Buchanan.
Jackway, R. E.,	M. E.,	Des Moines,	Polk.
Jenks, L. L.,	E. E.,	Lamont,	Buchanan.
Jenness, C. F.,	Agr.,	Waterloo,	Blackhawk.
Johnson, Earl H.,	Agr.,	Boone,	Boone.
Johnson, H. W.,	Agr.,	Mason City,	Cerro Gordo.
Kelley, Raymond,	M. E.,	Ames,	Story.
Kelly, Ivan D.,	Agr.,	Newton,	Jasper.
Kenny, Claude R.,	C. E.,	Early,	Sac.
Kingsbury, Mabel,	D. E.,	Ames,	Story.
Kirk, Geo.,	Agr.,	Clemons,	Marshall.
Kirkham, Kenzie,	M. E.,	Ames,	Story.
Kirkpatrick, Ellis L.,	Agr.,	South English,	Keokuk.
Krull, Clara,	D. E.,	Valley Junction,	Polk.
Kukkuck, Edward,	E. E.,	Preston,	Jackson.
Lannon, Rose,	D. E.,	Pueblo,	*Colorado.*
Lawson, Alfred A.,	A. H.,	Batavia,	Jefferson.
Lawton, I. A.,	M. E.,	Newell,	Buena Vista.
Lee, A. Earle,	E. E.,	Waterloo,	Blackhawk.
Leonard, Ed. A.,	Agr.,	Creston,	Union.
Lerdall, A. T.,	Sci.,	Ames,	Story.
Letts, Warren,	Agr.,	Columbus Jct.,	Louisa.
Lissenden, Clyde H.,	Sci.,	Scranton,	Greene.

Longer, Fred,	C. E.,	Washington,	Washington.
Loughrer, T. H.,	Agr.,	Cardoff,	*England.*
MacKenzie, C. R.,	C. E.,	Boston,	*Massachusetts.*
Macklin, Wm.,	Agr.,	Ames,	Story.
Madero, E. E.,	Agr.,	Mexico City,	*Mexico.*
Madson, Walter,	Ceramics,	Hutchinson,	*Minnesota.*
Marsh, Geo.,	Mn. E.,	Atlantic,	Cass.
Mattoon, Blanche,	D. E.,	Washta,	Cherokee.
Mead, Edward,	Agr.,	Bouton,	Dallas.
Mellor, Bessie,	D. E.,	Ames,	Story.
Mennis, Elwood C.,	C. E.,	Early,	Sac.
Mereness, Arthur,	C. E.,	Glidden,	Carroll.
Mohr, Earl L.,	Sci.,	Westfield,	Plymouth.
Money, Harry,	Agr.,	Red Oak,	Montgomery.
Morris, Levi M.,	Agr.,	Linn Grove,	Buena Vista.
Myers, D. E.,	E. E.,	Hardy,	Humboldt.
McBride, Forrest,	Agr.,	Stanhope,	Hamilton.
McConnell, R. E.,	E. E.,	Irwin,	Shelby.
McDonald, Cecil F.,	M. E.,	Jewell,	Hamilton.
McNay, Harry,	Agr.,	Chariton,	Lucas.
Nash, Bessie,	D. E.,	Ames,	Story.
Nash, H. B.,	Agr.,	Denison,	Crawford.
Nelson, Girton,	Agr.,	Cambridge,	Story.
Nemmers, LeRoy,	E. E.,	Bancroft,	Kossuth.
Nesbitt, Geo.,	M. E.,	Winfield,	Henry.
Noble, Gaylord K.,	Agr.,	Riceville,	Mitchell.
Notestine, Floyd A.,	C. E.,	Hardy,	Humboldt.
O'Conner, C. J.,	M. E.,	Sioux City,	Woodbury.
Olson, Sanford,	Agr.,	Kelly,	Story.
Osborn, C. G.,	E. E.,	Ellsworth,	Hamilton.
Ostling, Ivan,	E. E.,	Nevada,	Story.
Parke, Madge,	Sci.,	Paullina,	O'Brien.
Parker, Lloyd,	Agr.,	Davenport,	Scott.
Parrett, Roy,	Sci.,	Batavia,	Jefferson.
Paterson, Jas.,	E. E.,	Marshalltown,	Marshall.
Paton, Lena,	Sci.,	Milford,	Dickinson.
Pearce, Edwin,	Agr.,	Bloomfield,	Davis.
Pflieger, Alma H.,	Sci.,	Ames,	Story.
Phillips, Fred,	E. E.,	Lewis,	Cass.
Prine, Edna,	D. E.,	Tama,	Tama.
Pritchard, Lloyd,	Agr.,	Garrison,	Benton.
Reed, Mae,	D. E.,	Des Moines,	Polk.
Remington, Paul,	E. E.,	Neola,	Pottawattamie.
Reppert, Ethel M.,	Sci.,	Cumberland,	Cass.
Rhine, A. J.,	Sci.,	Edgewood,	Clayton.
Rieke, Herbert,	A. H.,	Blairstown,	Benton.
Ringheim, Horace,	Agr.,	Canton,	*South Dakota.*
Rink, Geo.,	E. E.,	Shelby,	Shelby.
Ritter, Harry,	Agr.,	Marshalltown,	Marshall.
Roddy, John P.,	E. E.,	Cedar Rapids,	Linn.
Sampson, Nevada,	D. E.,	Mason City,	Cerro Gordo.
Scace, Guy,	Sci.,	Primghar,	O'Brien.
Scheelhaase, Frank,	E. E.,	Moville	Woodbury.
Schoch, Henry C.,	E. E.,	Dubuque,	Dubuque.
Schryver, S. K. M.,	Agr.,	Allison,	Butler.
Schwab, J. W.,	Agr.,	Stilson,	Hancock.
Schwertley, John H.,	C. E.,	Modale,	Harrison.
Scott, Mrs. Elizabeth,	D. E.,	Ames,	Story.
Scott, Minnie Elizabeth,	D. E.,	Ames,	Story.

Seba, H.,	E. E.,	Monticello,	Jones.
Shea, Edward B.,	C. E.,	Milwaukee,	*Wisconsin.*
Shipley, H. E.,	Agr.,	Tipton,	Cedar.
Shugart, Bernice,	Sci.,	Ames,	Story.
Shutt, John C.,	M. E.,	St. Charles,	Madison.
Silva, Wm. H.,	Agr.,	M. Kalarash,	*Russia.*
Silver, Frank,	Agr.,	Cantril,	Van Buren.
Simms, Bessie,	Sci.,	Beaman,	Grundy.
Skahill, P. H.,	E. E.,	Des Moines,	Polk.
Skinner, S. P.,	Agr.,	Westfield,	*New York.*
Smith, Earl,	Agr.,	Clemons,	Marshall.
Smith, Grace,	Sci.,	Ames,	Story.
Smith, Grace,	D. E.,	Council Bluffs,	Pottawattamie.
Smith, Mark,	E. E.,	Nashua,	Chickasaw.
Smith, Roy M.,	C. E.,	Bonaparte,	Van Buren.
Snakenberg, Clifford,	Agr.,	Webster,	Keokuk.
Soper, Harry D.,	E. E.,	Collins,	Story.
Souder, Geo. S.,	Agr.,	Rockwell City,	Calhoun.
Spencer, Lawrence W.,	Agr.,	Clarion,	Wright.
Steele, B. W.,	C. E.,	Winterset,	Madison.
Stevens, Will,	E. E.,	Montour,	Tama.
Stillwagon, Geo.,	M. E.,	Victor,	Iowa.
Strickler, Omar,	Agr.,	Centerville,	Appanoose.
Sumner, Maude,	D. E.,	Fairfield,	Jefferson.
Sutherland, H. B.,	Agr.,	Ames,	Story.
Sykes, A.,	M. E.,	Manilla,	Crawford.
Tallman, Frank,	Sci.,	Jewell,	Hamilton.
Thomas, Lester,	Agr.,	Elvaston,	*Illinois.*
Thornburg, Tom H., Jr.,	Agr.,	Linden,	Dallas.
Tinsley, Vernon,	M. E.,	Ames,	Story.
Toms, Robt.,	E. E.,	Marion,	Linn.
Tudor, J. M.,	A. H.,	Iowa City,	Johnson.
Ufford, Orville,	Agr.,	Ames,	Story.
Un, Chung C.,	Agr.,	Canton,	*China.*
Vale, Bruce A.,	Agr.,	Bonaparte,	Van Buren.
Van Eizenga, J. J.,	C. E.,	Orange City,	Sioux.
Van Horn, Ralph,	C. E.,	Albion,	Marshall.
te Veltrup, Edward,	E. E.,	Sioux Center,	Sioux.
Wagner, Geo. I.,	Sci.,	Calamus,	Clinton.
Walker, Marion,	D. E.,	Vinton,	Benton.
Watson, Wm.,	Agr.,	Rock Rapids,	Lyon.
Watts, Everett,	E. E.,	Hedrick,	Keokuk.
Weller, Curtis,	C. E.,	New London,	Henry.
White, Muriel,	D. E.,	Marion,	Linn.
Whitford, Guy,	Agr.,	Volga,	Clayton.
Wilfong, L. J.,	E. E.,	Mason City,	Cerro Gordo
Williams, Ira G.,	E. E.,	Blairsburg,	Hamilton.
Wilson, Charles,	C. E.,	Traer,	Tama.
Wood, H. N.,	Agr.,	Iowa Falls,	Hardin.
Wood, Roy A.,	Agr.,	Moorehead,	Monona.
Wormley, B. H.,	A. H.,	Newton,	Jasper.
Wygle, Leonard P.,	Agr.,	Ames,	Story.

SPECIALS

NAME	COURSE	TOWN	COUNTY
Allison, J. H.,	Agr.,	Ames,	Story.
Armstrong, B. W.,	A. H.,	Hawarden,	Sioux.
Baldus, Chas.,	A. H.,	Story City,	Story.

Barker, Edna,	Sci.,	Ames,	Story.
Bedell, L. F.,	A. H.,	Springville.	Linn.
Besack, Jessica,	D. E.,	Newton.	Jasper.
Blackwood, R. L.,	A. H.,	Newton.	Jasper.
Brandt, H. O.,	A. H.,	Rock Rapids,	Lyon.
Brown, C. H.,	A. H.,	Galesburg,	*Illinois.*
Brown, Lola,	Sci.,	Boone.	Boone.
Burke, Ira H.,	A. H.,	Partridge,	*Kansas.*
Butterfield, W. S.,	A. H.,	Norfolk	*Nebraska.*
Cassady, R. W.,	A. H.,	Whiting,	Monona.
Christian, O. H.,	A. H.,	Rolan,	Worth.
Church, D.,	A. H.,	Hampton,	Franklin.
Clemons, V. J.,	Agr.,	Clemons.	Marshall.
Connelly, W. F.,	A. H.,	Cresco,	Howard.
Cosgriff, H. C.,	A. H.,	Clarence,	Cedar.
Dale, A. Clay,	C. E.,	Boone,	Boone.
Davenport, Lora,	Sci.,	Odebolt,	Sac.
Davis, Roy,	M. E.,	Toledo,	Tama.
Day, Edna,	D. E.,	Keosauqua,	Van Buren.
Denny, Bertha,	D. E.,	Des Moines,	Polk.
Donovan, Helen,	Sci.,	Ames,	Story.
Doolittle, Winnefred,	Sci.,	Ames,	Story.
Easter, Mary,	D. E.,	Bonaparte,	Van Buren.
Engberg, J. A.,	C. E.,	Kiron,	Crawford.
Erb, Erwin,	Agr.,	West Liberty,	Muscatine.
Erickson, Geo. H.,	C. E.,	Armstrong,	Emmet.
Escher, Earl,	A. H.,	Tipton,	Cedar.
Farquhar, Fred,	Agr.,	Tarkio,	*Missouri.*
Fraseur, F. N.,	A. H.,	Tipton,	Cedar.
Fuller, Bertha,	Sci.,	West Liberty,	Muscatine.
George, Thomas J.,	A. H.,	Monticello,	Jones.
Good, Harry C.,	Agr.,	Moline,	*Illinois.*
Gould, John M.,	A. H.,	Cleburne,	*Texas.*
Graham, Sappho C.,	Sci.,	Creston,	Union.
Griffith, W. A.,	C. E.,	West Point,	Lee.
Grimes, E. L.,	A. H.,	Jolley,	Calhoun.
Gring, Robt.,	A. H.,	Storm Lake,	Buena Vista.
Grove, Elmer,	A. H.,	Rockwell City,	Calhoun.
Grubb, Edmund,	Agr.,	Carbondale,	*Colorado.*
Gruwell, Harry,	E. E.,	West Branch,	Cedar.
Hall, Everett,	Hort.,	Whiting,	Monona.
Hartnell, Bert J.,	A. H.,	Stacyville,	Mitchell.
Harvey, E. E.,	A. H.,	Jolley,	Calhoun.
Hathaway, D. B.,	A. H.,	Turin,	Monona.
Herrick, R. L.,	A. H.,	Riga,	*Russia.*
Hinkhouse, Fred W.,	A. H.,	West Liberty,	Muscatine.
Holston, Verner M.,	A. H.,	Ames,	Story.
Hoskins, E. M.,	A. H.,	Cedar,	Mahaska.
Houghton, G. B.,	Agron.,	Hedrick,	Keokuk.
Hulburd, Christina,	D. E.,	Otho,	Webster.
Hully, Clay A.,	A. H.,	Elliott,	Montgomery.
Hultequist, F. L.,	Agr.,	Swedesburg,	Henry.
Igo, Phil,	Agr.,	Indianola,	Warren.
Iker, Don,	A. H.,	Blanchard,	Page.
Ingersoll, Pearl,	Hort.,	Coburg,	Montgomery.
Johnson, Ollie,	D. E.,	Ames,	Story.
Keeny, Leon,	Agr.,	Woodburn,	Clark.
King, J. A.,	Agron.,	Ames,	Story.
Kirch, Henrietta,	Sci.,	Des Moines,	Polk.

Kremenak, E. W.,	E. E.,	Toledo,	Tama.
Kuebler, Leonard J.,	Hort.,	Calamus,	Clinton.
Kuehl, Harry L.,	Agr.,	Davenport,	Scott.
Larson, Chas. F.,	A. H.,	LaMoille,	Marshall.
Larson, H. W.,	Sci.,	Swea City,	Kossuth.
Laurence, Stella M.,	D. E.,	Ames,	Story.
Lawson, E. W.,	A. H.,	Burkes Garden,	*Virginia.*
Leffler, A. R.,	A. H.,	Stockport,	Van Buren.
Leffler, Martha,	D. E.,	Stockport,	Van Buren.
Leffler, Mary,	D. E.,	Stockport,	Van Buren.
Letts, Mary,	Sci.,	Columbus Jct.,	Louisa.
Long, Bert S.,	A. H.,	Everly,	Clay.
Long, Edith,	Sci.,	Centerville,	Appanoose.
Loonin, Lloyd L.,	A. H.,	Waterloo,	Blackhawk.
Magill, John,	C. E.,	Vail,	Crawford.
Martin, Hazel,	D. E.,	Ames,	Story.
Meneray, A. O.,	Mn. E.,	Council Bluffs,	Pottawattamie.
Miller, Frank S.,	M. E.,	Clarence,	Cedar.
Minkler, H. L.,	Agr.,	Nevada,	Story.
Montgomery, C. J.,	Agr.,	Rock Island,	*Illinois.*
Morgan, E. K.,	Agr.,	Davenport,	Scott.
Myers, H. H.,	A. H.,	Tipton,	Cedar.
McCarger, H. A.,	E. E.,	Council Bluffs,	Pottawattamie.
McDonald, Ethel,	D. E.,	Ames,	Story.
McKelvey, Quintin,	Agr.,	Corydon,	Wayne.
McMillan, H. G.,	Agr.,	Sioux City,	Woodbury.
Nelson, Fred,	Agr.,	Nevada.	Story.
Nolan, Bob,	A. H.,	Hawarden,	Sioux.
Oglesby, W. B.,	A. H.,	Draper,	*Virginia.*
Patty, Ralph,	Agr.,	Redfield,	Dallas.
Penick, Raymond A.,	A. H.,	Chariton,	Lucas.
Person, Nora E.,	Sci.,	Ames,	Story.
Pettinger, Celestine M.,	Sci.,	Cumberland,	Cass.
Poore, Robt. H .,	Agron.,	Council Bluffs,	Pottawattamie.
Rankin, W. A.,	A. H.,	Greeley,	*Colorado.*
Rehn, V. L.,	A. H.,	Crocker,	*Missouri.*
Reynoldson, L. A.,	Hort.,	Primghar,	O'Brien.
Rudd, J. H.,	A. H.,	Cedar Rapids,	Linn.
Schader, Curtis,	C. E.,	Preston,	Jackson.
Seeberger, K. D.,	Sci.,	Newton,	Jasper.
Simanson, Arnold,	Hort.,	Salesmunde,	*Russia.*
Speers, Harry V.,	Agr.,	Marshalltown,	Marshall.
Spencer, J. E.,	A. H.,	Detroit,	*Michigan.*
Stead, J. H.,	Agr.,	Burroak,	Winneshiek.
Steen, Dorothea,	D. E.,	West Liberty,	Muscatine.
Stewart, S. A.,	C. E.,	Des Moines,	Polk.
Stillman, Lee A.,	Hort.,	Des Moines,	Polk.
Stuart, Reece,	C. E.,	Des Moines,	Polk.
Swindell, Chas. W.,	A. H.,	Ryan,	Delaware.
Swift, Gaylord K.,	Sci. & Agr.,	Harlan,	Shelby.
Taff, Paul C.,	Agr.,	Panora,	Guthrie.
Thomson, J. B.,	A. H.,	Cherokee,	Cherokee.
Tilden, B. A.,	Agron.,	Ames,	Story.
Van Meter, R. L.,	A. H.,	Clemons,	Marshall.
Van Osdol, A. S.,	A. H.,	Fostoria,	Clay.
Wagner, C. A.,	C. E.,	Boone,	Boone.
Wallace, D. P.,	A. H.,	Chicago Heights,	*Illinois.*
Wearin, J. F.,	A. H.,	Hastings,	Mills.
Werges, Sidney J.,	A. H.,	Saint Olaf,	Clayton.

Wettstein, Adolph,	M. E.,	Ames,	Story.
White, Leo P.,	A. H.,	Mount Vernon,	Linn.
Widen, Edward,	A. H.,	Harcourt,	Webster.
Wilmarth, R. H.,	C. E.,	Ames,	Story.
Wise, L. O.,	A. H.,	Villisca,	Montgomery.
Wood, Lenora,	A. H.,	Wiota,	Cass.
Woodford, L. G.,	Mn. E.,	Council Bluffs,	Pottawattamie.

ONE YEAR DAIRY

NAME	TOWN	COUNTY
Assink, Geo.,	Cedar Falls,	Blackhawk.
Campbell, Robt.,	Ames,	Story.
Chiles, J. L.,	Buckner,	*Missouri.*
Cramore, Ed.,	Fredsville,	Grundy.
Day, E. L.,	Des Moines,	Polk.
DeRoos, John,	Hull,	Sioux.
Dibrell, Harvey,	Seguin,	*Texas.*
Gregory, C. J.,	Lake Park,	Dickinson.
Hanna, Leland,	Garrison,	Benton.
Harvey, Guy,	Ames,	Story.
Hiestand, E. L.,	Ames,	Story.
Hoggatt, E. H.,	Ames,	Story.
Jacobs, Wynne,	Forest City,	Winnebago.
Jeanson, R. E.,	Des Moines,	Polk.
Johnson, Axel,	Hjorin,	*Denmark.*
Laney, J. Clarence,	Des Moines,	Polk.
Lorenzen, John T.,	Saint Ansgar,	Mitchell.
Marienan, W. A.,	Ireton,	Sioux.
Meltzer, Irvin,	Ames,	Story.
Morse, Wallace,	Ames,	Story.
Persinger, Earl,	Whiting,	Monona.
Person, Joseph,	Ames,	Story.
Russell, Frank,	Pocahontas,	Pocahontas.
Smith, Dan M.,	Ames,	Story.
Stevens, Chester B.,	West Liberty,	Muscatine.
Sweitzer, Earl,	Waterloo,	Blackhawk.
Trullinger, S. B.,	Farragut,	Fremont.
Underwood, F. A.,	Ames,	Story.
Van Dam, Martin,	Boyden,	Sioux.

MUSIC STUDENTS

NAME	COURSE	TOWN	COUNTY
Amlund, Therese,	O.,	Story City,	Story.
Barnes, Hattie,	Vn.,	Gilbert,	Story.
Barrington, Edith M.,	P.,	West Branch,	Cedar.
Baughman, Kittie,	P.,	Ames,	Story.
Beach, Frank,	P.,	Ames,	Story.
Beach, Julius,	P.,	Ames,	Story.
Brown, Ida,	P. V.,	Gilbert,	Story.
Chadsey, Fern,	P.,	Ames,	Story.
Cobb, Marie,	P. V.,	Boone,	Boone.
Colburn, Mrs. F. E.,	P.,	Ames,	Story.
Cole, Marie,	P.,	Ames,	Story.
Colman, Candace,	P. V.,	Ames,	Story.
Conaway, Richard,	Vn.,	Ames,	Story.
Curtiss, Edith,	P.,	Ames,	Story.
Curtiss, Ruth,	Vn.,	Ames,	Story.

Doggatt, W. H.,	V.,	Ames,	Story.
Edwards, Reba,	P.,	Ames,	Story.
Feroe, John J.,	V.,	Ames.	Story.
Fleetwood, Blanche,	V.,	Ames,	Story.
Furnas, Mildred E.,	P. O. H.,	Nevada,	Story.
Gehl, Martha W.,	V.,	Traer,	Tama.
George, Max,	V.,	Ames,	Story.
Handsaker, Ethel,	P. V.,	Colo,	Story.
Harding, Harris,	V. P.,	Sioux City,	Woodbury.
Heuer, Lydia,	P.,	Dows,	Wright.
Holden, Eugene D.,	P.,	Ames,	Story.
John, Eva May,	O.,	Nevada,	Story.
Jones, Katherine,	V.,	Omaha,	*Nebraska.*
Kingkade, Mabel,	V.,	Ames,	Story.
Knapp, Hermine,	P.,	Ames,	Story.
Kooser, Ronald,	Vn.,	Ames,	Story.
Lang, Adeline,	P.,	Nevada,	Story.
Lee, Clara,	P.,	Humboldt,	Humboldt.
Longshore, Margaret,	V.,	Ames,	Story.
Lynde, Nellie,	P.,	Des Moines,	Polk.
Madson, Luella,	P.,	Ames,	Story.
Marston, Morrill,	P.,	Ames,	Story.
Mereness, Gertrude,	V. P.,	Ames,	Story.
Minchin, Medra,	P.,	Ames,	Story.
Morris, Edward,	P.,	Ames,	Story.
McCarthy, Florence,	V.,	Ames,	Story.
McDonald, Myrtle,	P.,	Ames,	Story.
Nelson, Kate,	P.,	Story City,	Story.
Newlin, Ora Mae,	P.,	Ames,	Story.
Nordskoy, Yette,	V.,	Story City,	Story.
O'Brien, Mrs. Floyd,	V. P.,	Ames,	Story.
Okey, Mrs. Myrtle,	P.,	Ames,	Story.
Orton, Emma,	P.,	Ames,	Story.
Parsons, Ruby,	V.,	Ames,	Story.
Pike, Ethel,	V.,	Ames,	Story.
Raney, Ethel,	P. H. Mus. H.,	Ames,	Story.
Richer, Lora,	V.,	Peru,	*Indiana.*
Ringgenberg, Calvin,	P.,	Ames,	Story.
Ringgenberg, Carl,	Vn.,	Ames,	Story.
Robb, Olive,	P. V. H.,	Estherville,	Emmet.
Ross, Agatha,	P.,	Ontario,	Story.
Shea, Grace,	Vn.,	Ames,	Story.
Shepard, Mabel,	V.,	Gilbert,	Story.
Shaw, Mrs. I. S.,	P.,	Ames,	Story.
Smith, Lulu,	V.,	Ames,	Story.
Storms, Lillian,	V.,	Ames,	Story.
Summy, Estes,	V. H. Mus. H.,	Ames,	Story.
Tinsley, Grace,	V.,	Ames,	Story.
Tune, Ingeborg,	P. V.,	Taastrup,	*Denmark.*
Tunis, Florence,	P.,	Ames,	Story.
Vangsnes, Selma,	V.,	Story City,	Story.
Vincent, Ruth,	P.,	Ames,	Story.
Wasser, Blanche,	P.,	Ames,	Story.
White, Zella Isabell,	P.,	Ames,	Story.
Wygle, Lila,	P.,	Ames,	Story.

P., Piano; V., Voice; O., Organ; H., Harmony; Vn., Violin.

ENROLLMENT FOR SHORT COURSES IN STOCK AND GRAIN JUDGING

NAME	TOWN	COUNTY
Abraham, Claus,	Essex,	Page.
Albaugh, Elmer L.,	Ankeny,	Polk.
Allen, C. W.,	Nevada,	Story.
Allen, Fred,	Lamoni,	Decatur.
Anderson, Edward J.,	Stanhope,	Hamilton.
Anderson, Lewis H.,	Stanhope,	Hamilton.
Apland, A.,	Huxley,	Story.
Armstrong, Leroy,	Le Grand,	Marshall.
Art, R. A.,	Hartford,	Warren.
Assink, Ben,	Kanawha,	Hancock.
Baird, Warner I.,	North English,	Iowa.
Bakehouse, Albert,	Sigourney,	Keokuk.
Bakker, William,	Kanawha,	Hancock.
Bane, Roy,	Bondurant,	Polk.
Barker, Earl R.,	Indianola,	Warren.
Barnes, B. H.,	Lamoni,	Decatur.
Barnes, John,	Greenfield,	Adair.
Barnett, C. E.,	Aredale,	Butler.
Bass, Gerald R.,	La Moille,	*Illinois.*
Baughman, C. B.,	Toledo,	Tama.
Beals, Archie E.,	Russell,	Lucas.
Beck, Arthur F.,	Kellerton,	Ringgold.
Beck, C. A.,	Granger,	Polk.
Bedell, L. F.,	Springville,	Linn.
Bender, Francis,	Avon,	Polk.
Benson, Albert T.,	Albia,	Monroe.
Benson, Alvin,	Popejoy,	Franklin.
Benson, E.,	Cherokee,	Cherokee.
Bevercombe, Ray,	Spaulding,	Adair.
Biewer, Chas. J.,	Ames,	Story.
Biggrir, F. J.,	Prairie City,	Jasper.
Binford, G. S.,	Liscomb,	Marshall.
Binkert, Ed.,	Lake City,	Calhoun.
Birlingmair, Robert H.,	Weldon,	Clarke.
Bishop, C. R.,	Altoona,	Polk.
Bishop, Garrie R.,	Mitchellville,	Polk.
Black, J. S.,	Maxwell,	Story.
Blake, John,	Carlisle,	Warren.
Blake, Richard,	Carlisle,	Warren.
Boleyn, C.,	Specht's Ferry,	Dubuque.
Boots, Emmett,	Panora,	Guthrie.
Boven, Dirk H.,	Grundy Center,	Grundy.
Boven, Henry H.,	Grundy Center,	Grundy.
Bovack, Geo.,	Grinnell,	Poweshiek.
Boyd, Allan,	Russell,	Lucas.
Boyd, G. S.,	Russell,	Lucas.
Boynton, C. S.,	Webster City,	Hamilton.
Brandt, Horace O.,	Rock Rapids,	Lyon.
Brayton, Ray I.,	Bancroft,	Kossuth.
Brewer, Evert,	Ackworth,	Warren.
Briley, B. C.,	Ames,	Story.
Brill, Leo,	Sac City,	Sac.
Brockett, George,	Runnells,	Polk.
Brockway, Charley,	Grundy Center,	Tama.
Brooks, Merle,	Hampton,	Franklin.

Brown, H. E.,	Salix,	Woodbury.
Brown, Howard F.,	Marcus,	Cherokee.
Brown, Ray E.,	Parkersburg,	Butler.
Bruce, Eddie,	Ackworth,	Warren.
Buihmer, Bert B.,	Lake View.	Sac.
Bunz, James,	Ankeny,	Polk.
Burgoon, Bert,	Paton,	Greene.
Burgy, Henry,	South Amana.	Iowa.
Burke, Clifford,	Ellsworth,	Hamilton.
Burmeister, Emiel E.,	Donahue,	Scott.
Burt, Neal,	Coggon,	Linn.
Butterfield, H. W.,	Sioux City,	Woodbury.
Byone, Francis M.,	Monticello,	Jones.
Caldwell, J. W.,	Afton,	Union.
Campbell, Clifford,	Swea City,	Kossuth.
Campbell, David,	Rockwell,	Cerro Gordo.
Carlson, J. N.,	Brooklyn,	Poweshiek.
Carr, Ernest,	Kanawha,	Hancock.
Cas, C. H.,	Yetter,	Calhoun.
Cassady, R. H.,	Whiting,	Monona.
Cchok, James V.,	Creston,	Union.
Ceranek, F. L.,	Audubon,	Audubon.
Chandler, Frank,	Kellerton,	Ringgold.
Chandler, H. S.,	Allen,	Dixon.
Charles, W. S.,	Prairie City,	Jasper.
Cheney, William H.,	Greene,	Butler.
Christenson, Otto,	Stanhope,	Hamilton.
Christiansen, John,	Charlotte,	Clinton.
Christianson, S. P.,	Story City,	Story.
Christofferson, George,	Ames,	Story.
Clampitt, R. R.,	New Providence,	Hardin.
Clarke, Chas. A.,	Manson,	Calhoun.
Clarke, Harry,	LeMars,	Plymouth.
Clevenger, Samuel H.,	Sidney,	Shelby.
Coiner, Chas. W.,	Malvern,	Mills.
Cold, F. F.,	Gladbrook,	Tama.
Collins, J. D.,	Pioneer,	Humboldt.
Comegyo, Glen,	Bondurant,	Polk.
Comstock, Jesse J.,	Burlington,	Des Moines.
Connolly, W. F.,	Cresco,	Howard.
Cool, Irwin,	Waverly,	Bremer.
Copeland, W. J.,	Blanchard,	Page.
Cornwell, C. L.,	Ankeny,	Polk.
Cosguiff, John R.,	Kanawha,	Hancock.
Cottam, C. H.,	Larchwood,	Lyon.
Cottam, Henry E.,	Larchwood,	Lyon.
Cowie, Ray,	Orilli,	Warren.
Cox, Gaylord,	Table Grove,	Fulton.
Craig, Chas.,	Mitchellville,	Polk.
Crandon, Arthur B.,	Gilman,	Marshall.
Crary, Alson,	Madrid,	Boone.
Crary, Ralph,	Madrid,	Boone.
Crigham, Frank,	Woodbine,	Harrison.
Crispin, H. H.,	New Sharon,	Mahaska.
Crozier, Raymond,	Knoxville,	Marion.
Crumpacker, John,	Afton,	Union.
Current, Earl,	Fort Nation,	Clinton.
Cutshall, Perry,	Van Meter,	Dallas.
Daniels, M. R.,	Pulaski,	Davis.

Davis, Edwin H.,	Avoca,	Pottawattamie.
Day, L. J.,	Afton,	Union.
Dean, W. L.,	West Branch,	Cedar.
Dee, John,	Brooklyn,	Poweshiek.
Deihl, Sam J.,	Wapello,	Louisa.
Dickens, O. C.,	Hedrick,	Keokuk.
Dill, J. B.,	Washington,	Washington.
Dillman, Glen,	Derby,	Lucas.
Doidge, Wm.,	Perry,	Dallas.
Donlea, Frank,	Rowley.	Buchannan.
Doolittle, T. N.,	Ames,	Story.
Doud, Edwin,	Eldora,	Hardin.
Draper, C. E.,	Sutherland,	O'Brien.
Dreyer, A. A.,	Fenton,	Kossuth.
Dreyer, H. K.,	Lone Rock,	Kossuth.
Drollinger, B. F.,	Fort Madison.	Lee.
Dunn, J. B.,	Ames,	Story.
Easterly, J. T.,	Ames,	Story.
Eckles, W. L.,	Marshalltown,	Marshall.
Eckman, Roy,	Kiron,	Sac.
Eckstein, Chris,	Stratford,	Boone.
Edmunds, Hugh,	Lenox,	Taylor.
Egbert, J. H.,	Bath,	*Ohio.*
Egli, Frank,	Grand Junction,	Green.
Eitel, Arthur,	Hawkeye,	Fayette.
Elliott, Carl,	Redfield,	Dallas.
Ellis, A. J.,	Iowa Falls,	Hardin.
Emerson, R. F.,	Clarence,	Cedar.
Endreland, Ole,	Story City,	Hamilton.
Engbritson, E. J.,	Story City,	Story.
Engestrom, Fred,	Renwick,	Humboldt.
Erickson, Carl I.,	Laurens,	Pocahontas.
Ericson, Eric,	Stratford,	Hamilton.
Esbeck, Willie,	Exira,	Audubon.
Eshbaugh, Paul L.,	Rockwell City,	Calhoun.
Espe, Knute,	Jewell,	Hamilton.
Estle, R. R.,	Minburn,	Dallas.
Ewing, John,	Seaton,	*Illinois.*
Eyestone, C. L.,	Wellman.	Washington.
Fagen, Ivyl R.,	Perry,	Dallas.
Farmer, G. E.,	Sioux Rapids,	Buena Vista.
Farquhar, Geo. P.,	Coin,	Page.
Feller, James C.,	Victor,	Iowa.
Felley, Leo B.,	Victor,	Iowa.
Ferguson, C. H.,	Fremont,	Mahaska.
Feuling, L. V.,	Ames,	Story.
Fink, Herman,	Valley Junction,	Polk.
Finch, R. E.,	Fredericksburg,	Chickasaw.
Finnegan, John,	Monteith,	Guthrie.
Fiske, W. W.,	Alden,	Hardin.
Flint, E. W.,	Nashua,	Chickasaw.
Florence, L. M.,	Middletown,	Des Moines.
Ford. Mark B.,	Cedar Falls,	Blackhawk.
Fortner, Clifford,	Knoxville,	Marion.
Fortner, Floyd,	Knoxville,	Marion.
Forsum, Adolph H.,	Waukon.	Allamakee.
Fossum, Otto H.,	Waukon,	Allamakee.
Frame, J. C.,	Salem,	Jefferson.
Frantz, H. A.,	Grand Junction,	Greene.

French, Walter B.,	Goldfield.	Wright.
Frerichs, Thee,	Ackley,	Hardin.
Frescohn, J. Raymond,	Batavia,	Jefferson.
Frescohn, Roy H.,	Batavia,	Jefferson.
Frick, Lyman,	Sheldahl,	Polk.
Friday, E. F.,	Sigourney,	Keokuk.
Frevert, Wesley,	Odebolt,	Sac.
Frye, Wilbert,	Davenport,	Scott.
Furman, Orville,	Webster City,	Hamilton.
Galbreath, Delbert,	Zearing,	Story.
Gailen, John,	Remsen,	Plymouth.
Gallagher, J. J.,	Norwalk,	Madison.
Garrels, Fred R.,	Churdan,	Green.
Garrity, J. J.,	De Witt,	Clinton.
Gemper, W. F.,	Des Moines,	Polk.
George, Thos. J.,	Monticello,	Jones.
Ghrist, C. E.,	Ames,	Story.
Gibson, E. C.,	Spaulding,	Union.
Gillespie, C. M.,	Mystic,	Appanoose.
Gilmore, Glenn G.,	Aledo,	*Illinois.*
Girton, Earl S.,	State Center,	Marshall.
Gorman, Patrick C.,	Merrill,	Plymouth.
Gould, Mrs. Floy,	Rockwell City,	Calhoun.
Grabe, Fred,	Pierson,	Woodbury.
Grace, Will N.,	Dixon,	Scott.
Gradin, Alfred,	Kiron,	Crawford.
Grandfish, Clark,	Lorimer,	Union.
Graves, Ned,	Ames,	Story.
Greenwood, Albert F.,	Charles City,	Floyd.
Greer, C. K.,	Monticello,	Jones.
Grimes, E. L.,	Jolley,	Calhoun.
Griswold, L. W.,	Cooper,	Greene.
Groat, Jesse,	Irwin,	Shelby.
Guernsey, S. C.,	Ames,	Story.
Guge, Ernest,	Estherville,	Emmet.
Gulick, Robert Oliver,	West Side,	Crawford.
Haddock, G. W.,	Marshalltown,	Marshall.
Haffa, L. A.,	Grundy Center,	Grundy.
Hager, Edward,	Perry,	Boone.
Hager, Tony,	Perry,	Boone.
Hagglund, Lenus,	Essex,	Page.
Hahn, Charley W.,	Moscow,	Muscatine.
Hahn, Grover W.,	Walcott.	Scott.
Haines, Will,	Rowley,	Buchanan.
Hall, Clyde,	Webster City,	Hamilton.
Hall, Ralph O.,	Webster City,	Hamilton.
Hallowell, Joe.,	Dow City,	Crawford.
Hamilton, A. L.,	Keota,	Washington.
Hamm, A. D.,	Shambaugh,	Page.
Hammond, George,	Orillia,	Warren.
Hannah, Paul A.,	Breda,	Carroll.
Hannah, R. Ralph,	Breda,	Carroll.
Hansen, Alfred C.,	Goldfield,	Wright.
Hanson, Carl H.,	Stanhope,	Hamilton.
Hanson, Edmund,	Dean,	Appanoose.
Hanson, Fred B.,	Inwood,	Lyon.
Hanson, William,	Dayton,	Webster.
Hardman, C. J.,	Ames,	Story.
Harmeyer, Al.,	West Point,	Lee.

Harriff, P. J.,	Lamoni,	Decatur.
Harrington, Ignatius,	Salix.	Woodbury.
Harris, G. C.,	Mystic,	Appanoose.
Haskins, Gilfert,	Pleasant Plain,	Jefferson.
Haulman, H. E.,	St. Charles,	Madison.
Hays, Lee,	Hamlin,	Audubon.
Hayden, T. M.,	Spaulding,	Union.
Heater, Worllie,	Ames,	Story.
Heil, P. W.,	Garrison,	Benton.
Heldreth, Art,	Alleman,	Polk.
Heldreth, J. W.,	Slater,	Polk.
Hendrickson, Henry,	Brooklyn,	Poweshiek.
Hendrickson, Jesse,	Brooklyn,	Poweshiek.
Henkels, N. B.,	Spechts Ferry,	Dubuque.
Henry, W. D.,	Carlisle,	Warren.
Henss, A. D.,	Mt. Pleasant,	Henry.
Herbold, F. L.,	Pierson,	Woodbury.
Herbold, Willie,	Pierson,	Woodbury.
Herriott, A. C.,	Casey,	Guthrie.
Herrn, Coyt R.,	Machsburg,	Madison.
Hevtor, Beaman,	Scranton,	Greene.
Hiatt, C. F.,	Mitchellville,	Polk.
Higginbotham, H. W.,	Eldora,	Hardin.
Hill, Clem,	Vail,	Crawford.
Hill, V. C.,	New Sharon,	Mahaska.
Hill, Jim,	Vail,	Crawford.
Hoff, S. W.,	Des Moines,	Polk.
Hoffman, Iven,	Afton,	Union.
Haggerty, M. C.,	Dexter,	Dallas.
Holland, W. E.,	Maxwell,	Story.
Holman, R. A.,	Rockwell,	Cerro Gordo.
Holston, V. M.,	Albion,	Noble.
Horning, F. J.,	Ankeny,	Polk.
Hoskins, E. M.,	Cedar,	Mahaska.
Hoversten, Jacob,	Jewell,	Hamilton.
Hovey, L. S., Jr.,	Jesup,	Buchanan.
Howser, Louis G.,	Kanawha,	Hancock.
Hubner, Albert,	Stratford,	Hamilton.
Hulbert, Ray M.,	Primghar,	O'Brien.
Hull, O. K.,	Taintor,	Mahaska.
Hultine, L. C.,	Essex,	Page.
Hunt, Roy,	Nashua,	Chickasaw.
Hunter, W. G.,	Anita,	Cass.
Hurst, C. G.,	West Branch,	Cedar.
Illian, C. F.,	Davenport,	Scott.
Iseminger, O. J.,	Altoona	Polk.
Israel, K. Y.,	Stockport,	Van Buren.
Ives, Clarence,	Inwood.	Lyon.
Jacobson, Annas A.,	Story City,	Story.
James, Warren,	West Liberty,	Muscatine.
Jamison, Guy,	Morning Sun,	Louisa.
Jennings, Ralph,	Van Meter,	Dallas.
Jennings, R. W.,	Van Meter,	Dallas.
Jenison, W. Max,	Indianola,	Warren.
Johnson, August H.,	Boone,	Boone.
Johnson, Casper,	Leland,	Winnebago.
Johnson, Chas. O.,	Hawarden,	Sioux.
Johnson, Elmer,	Kiron,	Sac.
Johnson, Emil H.,	Marathon,	Buena Vista.

Johnson, John,	Ida Grove,	Ida.
Johnson, J. E.,	Meadsville,	*Missouri.*
Johnson, John O.,	Estherville,	Emmet.
Johnson, Ludwig,	Cylinder,	Palo Alto.
Jones, C. W.,	Knoxville,	Marion.
Jones, Elmer,	Knoxville,	Marion.
Jones, John M.,	Storm Lake,	Buena Vista.
Jones, John W.,	Dexter,	Dallas.
Jones, R. D.,	Gilbert,	Story.
Jones, Vann,	Union,	Marshall.
Jorgenson, Fred,	Delmar,	Clinton.
Kading, Arthur,	Casey,	Guthrie.
Kaiser, Elmer L.,	Dallas City,	Hancock.
Kalsem, Philip,	Ames,	Story.
Kappes, Frank,	Ashton,	Osceola.
Keables, Roy S.,	Gilman,	Marshall.
Keeling,	Des Moines,	Polk.
Keenan, Frank,	Shenandoah,	Page.
Kelley, Russell,	Clarinda,	Page.
Kennedy, Roy W.,	Eldon,	Hardin.
Kent, Oscar,	Lowden,	Cedar.
Kerr, J. L.,	Waterloo,	Blackhawk.
Ketelson, Thos. P.,	Charlotte,	Clinton.
King, F.,	Rolfe.	Pocahontas.
King, John W.,	Guthrie Center,	Guthrie.
Kinney, B. H.,	Dayton,	Webster.
Klein, Judson,	Spirit Lake,	Dickinson.
Klosterman, Ed.,	Ashton,	Osceola.
Koesser, William,	Walker,	Buchanan.
Kooser, Calen B.,	Ames,	Story.
Kortrom, Frank,	Estherville,	Emmet.
Kruckerbocker, Nelson,	Radcliffe,	Hardin.
Kruse, Ferdinand L.,	Charlotte,	Clinton.
Kruse, John L. A.,	Goose Lake,	Clinton.
Krusemark, Louis,	Sheffield.	Franklin.
Kurtz, Frank,	Pleasant Plain,	Jefferson.
Kurtz, Hubert P.,	Pleasant Plain,	Jefferson.
Kuska, Val,	Silver Creek,	Delaware.
Laage, W. E.,	Fenton,	Kossuth.
Lacock, Clarke,	Boone,	Boone.
Lamb, Charles E.,	Jefferson,	Greene.
Lamb, Robert R.,	Jefferson,	Greene.
Lamp, Henry,	Eldridge,	Scott.
Lang, A. A.,	Brooklyn,	Poweshiek.
Lang, Joe,	Wilton Junction,	Muscatine.
Larpman, Claude,	Ames,	Story.
Larson, Gerald W.,	Story City,	Story.
Larson, Rolland,	Forest City,	Hancock.
Lauritsen, Carl,	Delmar,	Clinton.
Lauritsen, Louie,	Delmar	Clinton.
Leamer, Herbert,	Princeton,	Scott.
Lehman, Edward,	Slater,	Story.
Lesch, Arthur,	Osage,	Mitchell.
Lett, Herbert,	Sandwich,	DeKalb.
Lewis, Ed.,	Ankeny,	Polk.
Lewis, Walter E.,	Marshalltown,	Marshall.
Link, Clarence,	Rock Rapids,	Lyon.
Loilir, R. A.,	Osceola,	Clarke.
Long, Bert S.,	Everly,	Clay.

Loynachan, C. C.,	Harvey,	Marion.
Longworth, Harral A.,	Polk City,	Polk.
Loveless, L. J.,	Orchard.	Mitchell.
Lucas, Rob, Jr.,	Kanawha,	Hancock.
Ludlow, H. Milton,	Worthington,	*Minnesota.*
Luedtke, Bennie,	Fenton,	Kossuth.
Luedtke, Ernest,	Fenton,	Kossuth.
Luke, Louis,	St. Mary's,	Warren.
Lundmark, Emery,	Stratford,	Hamilton.
Lundy, Thos. G.,	Zearing,	Story.
Lynch, L. J.,	Ames,	Story.
Lyth, Walter A.,	Oskaloosa,	Mahaska.
Madison, Albert,	Goldfield,	Humboldt.
Madison, Marquis,	Goldfield,	Humboldt.
Maney, H. C.,	Early,	Sac.
Markley, Arthur R.,	Estherville,	Emmet.
Mason, Claud,	Iowa Falls,	Hardin.
Mason, J. A.,	Carlisle.	Warren.
Mason, L. N.,	Webster City,	Hamilton.
Massey, W. R.,	Woodland.	Decatur.
Mather, Dayton,	Clarkesville,	Butler.
Mawdsley, Clarence,	Burt	Kossuth.
Maynard, R. W.,	Inwood.	Lyon.
Mayne, Arthur P.,	Mason City.	Cerro Gordo.
McAndrew, Patrick H.,	Portsmouth.	Shelby.
McCaffres, H. A.,	Janesville,	Bremer.
McClure, Ray,	Lacey.	Mahaska.
McComber, Joe D.,	Eagle Grove,	Wright.
McConnell, Edith Neely,	Linden.	Dallas.
McConnell, R. C.,	Linden	Dallas.
McConnell, T. H.,	Princeton.	Scott.
McCutchen, Will H.,	Eagle Grove,	Wright.
McDaniel, L. C.,	Medon.	Madison.
McDermott, G. E.	Anita.	Cass.
McDougall, C. M.,	Melvin	Osceola.
McElroy, E. C.,	Newton	Jasper.
McGinn, John,	Earling,	Shelby.
McGowan, Will E.,	Goldfield.	Wright.
McKay, Albert M.,	Ida Grove.	Ida.
McKee, Alex,	Rock Rapids,	Lyon.
McKinley, Philip,	Rock Rapids.	Lyon.
McMaster, Tom,	Onslow.	Jones.
McMeepin, Glenn L.,	Lake City,	Calhoun.
Mendoza, J. P.,	Buenos Aires,	*Argentine.*
Mernhard, Henry,	Storm Lake.	Buena Vista.
Merrill, E. W.,	Rock Rapids,	Lyon.
Merritt, Archie G.,	Kellerton.	Ringgold.
Messer, R. J.,	Hedrick.	Keokuk.
Meyer, Aug. B.,	Breda.	Carroll.
Meyer, Clarence,	Van Meter.	Madison.
Meyer, John W.,	Minden.	Pottawattamie.
Middleton, J. C.,	Eagle Grove,	Wright.
Miles, Ed. M.,	Lake City,	Calhoun.
Miller, Clarence,	Brooklyn,	Poweshiek.
Miller, Frank,	Clarence.	Cedar.
Miller, Joe,	St. Mary's,	Warren.
Miller, Ora,	Preston,	Jackson.
Miller, W. A.,	Prescott,	Adams.
Moffit, Chas. J.,	Lorimor,	Union.

Mommsen, Willie,	Goose Lake,	Clinton.
Montgomery, F. H.,	Mt. Pleasant,	Henry.
Moore, C. H.,	Des Moines,	Polk.
Morgan, Gould,	Spencer,	Clay.
Morris, Adis,	Carlisle,	Warren.
Mountain, Chas. R.,	West Liberty,	Muscatine.
Mowery, K. C.,	Hedrick,	Jefferson.
Muller, Herbert,	Osage,	Mitchell.
Muller, H. E.,	Victor,	Iowa.
Muller, John H.,	Victor	Iowa.
Myers, R. V.,	Dallas City,	*Illinois.*
Myers, Stephen,	Missouri Valley,	Harrison.
Nash, H. B.,	Denison,	Crawford.
Neal, Theo.,	Shellrock,	Butler.
Neil, Charles F.,	Long Grove,	Scott.
Nelson, Alfred,	Eagle Grove,	Humboldt.
Nelson, B. A.,	Brayton,	Audubon.
Nelson, C. A.,	Jewell Junction,	Hamilton.
Nelson, Emil,	Stratford,	Hamilton.
Nelson, E. L.,	Harlan,	Shelby.
Nelson, Miller S.,	Goldfield,	Wright.
Nippel, James,	Carroll,	Carroll.
Nichols, Clarence,	Rock Rapids,	Lyon.
Nims, F. J.,	Emerson,	Mills.
Norris, D. C.,	Prairie City,	Jasper.
Norris, Elmo,	Prairie City,	Jasper.
Northrup, Rollin,	Eldora	Hardin.
Olsen, Alfred J.,	Webster City,	Hamilton.
Olson, George M.,	Radcliffe,	Hamilton.
Olson, John O.,	St. Ansgar,	Mitchell.
Olson, J.,	Waterville,	Allamakee.
Olson, Louis T.,	Ames,	Story.
Orley, Fred E.,	Cornwith,	Hancock.
Orr, John,	Rowley,	Buchanan.
Overland, Jasper,	Jewell,	Hamilton.
Overton, C. W.,	Knoxville,	Marion.
Oxley, E. E.,	Atalissa,	Muscatine.
Oxley, Paul,	Atalissa,	Muscatine.
Packer, K. L.,	Rockwell City,	Calhoun.
Page, Harry L.,	Sioux City,	Woodbury.
Paine, H. W.,	Eagle Grove,	Wright.
Paine, Morris,	Eagle Grove,	Wright.
Park, Homer,	Mechanicsville,	Cedar.
Patterson, Ray,	Sioux City,	Woodbury.
Patton, James O.,	Albia,	Monroe.
Paulson, H. C.,	Camanche,	Clinton.
Pearson, E. L.,	Mitchellville,	Polk.
Pellett, Clarence A.,	Atlantic,	Cass.
Perrin, Loren,	Albia,	Monroe.
Person, Ben H.,	Adelphi,	Polk.
Peters, Ray J.,	West Side	Crawford.
Peterson, Arthur,	Exira,	Audubon.
Peterson, Carl,	Cherokee,	Cherokee.
Peterson, Elmer,	Kiron,	Crawford.
Peterson, Emanuel,	Harcourt,	Webster.
Peterson, Ernest,	Cherokee,	Cherokee.
Peterson, Harold W.,	Aredale,	Butler.
Peterson, John R.,	Mason City,	Cerro Gordo.
Peterson, M. C.,	Randall,	Hamilton.

Peterson, Saren C.,	Nevada,	Story.
Peterson, Yeno W.,	Nevada,	Story.
Phillips, Carl E.,	Centerville,	Appanoose.
Phillips, Fred S.,	Clarence,	Cedar.
Picken, T. A.,	Cedar,	Mahaska.
Pickett, Earl L.,	Marshalltown,	Marshall.
Pierce, Oscar,	Janesville,	Bremer
Platt, Burchard,	Cedar Falls,	Blackhawk.
Platt, Walter J.,	Cedar Falls,	Blackhawk.
Porter, F. L.,	Stanwood,	Cedar.
Porter, J. F.,	Olin,	Jones.
Powell, Lee,	Ackworth,	Warren.
Powers, J. F.,	Persia,	Harrison.
Powers, R. J.,	Persia,	Harrison.
Presterman, Alvin,	Waukon,	Allamakee.
Proctor, Ralph,	Monroe Center,	*Illinois.*
Proudfit, I. E.,	Altoona,	Polk.
Proudfit, M. J.,	Mitchellville,	Polk.
Proudfit, R. E.,	Altoona,	Polk.
Publes, Fred,	Lake City,	Calhoun.
Publes, Murry,	Lake City,	Calhoun.
Pyle, J. J.,	Carlisle,	Warren.
Rabe, L. G.,	Alta Vista,	Chickasaw.
Rahn, Ello,	Lone Rock,	Kossuth.
Rainier, Frank,	Logan,	Harrison.
Randell, C. W.,	Cedar,	Mahaska.
Rasmussen, Hans,	Eagle Grove,	Humboldt.
Redling, Theodore, Jr.,	Jewell Junction,	Hamilton.
Reed, Spencer,	Washington,	Washington.
Rees, W. D.,	Emerson,	Montgomery.
Reeve, John,	Hampton,	Franklin.
Reeves, E. M.,	Waverly,	Bremer.
Reeves, Raie,	Berwick,	Polk.
Reid, Willson,	Morning Sun,	Louisa.
Reidel, Arthur J.,	Albion,	Marshall.
Reisinger, H. A.,	Eldora,	Hardin.
Rex, E. M.,	Winburn,	Dallas.
Rhoades, C. A.,	Cooper,	Greene.
Rice, B. B.,	Grand Island,	*Nebraska.*
Richards, Ralph W.,	Ford,	Warren.
Rickert, Emil,	Reinbeck,	Grundy.
Ridpath, J. W.,	New Sharon,	Mahaska.
Rieke, Herbert,	Blairstown,	Benton.
Risetter, William S.,	Lee,	Lee.
Roberts, Melvyn,	Madrid,	Boone.
Rockafellow, Raymond,	West Liberty,	Muscatine.
Rollins, Jim L.,	Grinnell,	Poweshiek.
Rooney, Jim B.,	Daugherty,	Cerro Gordo.
Ruprecht, Ang.,	Massillon,	Cedar.
Russell, Carl,	Milton,	Davis.
Russell, E. A.,	Menlo,	Guthrie.
Sackerson, David,	Ogden,	Boone.
Sanders, Claude L.,	Ames,	Story.
Sargent, Wesley E.,	Sargeant's Bluffs,	Woodbury.
Scales, S. L.,	Corydon,	Wayne.
Schafer, Julius G.,	Dysart,	Tama.
Schneider, Henry,	Lowden,	Cedar.
Schneitz, H. L.,	Halbur	Carroll.
Schnitter, W. H.,	Delhi,	Delaware.

Schoonover, I. P.,	St. Ansgar,	Mitchell.
Schrater, F. R.,	Langdon,	Atchison.
Schreiber, Martin,	Sileb,	Osceola.
Schriver, C. Floyd,	Rockwell City,	Calhoun.
Schnitter, D. J.,	Delhi,	Delaware.
Schultz, Herman L.,	Lost Nation,	Clinton.
Sealine, Anton,	Stanhope,	Hamilton.
Sedom, G. W.,	Mapleton,	Monona.
Seehorn, Fayne,	Iowa City,	Johnson.
Seiferling, C. G.,	Mitchellville,	Polk.
Shain, J. O.,	Jefferson,	Greene.
Shakespeare, W. E.,	Lamoni,	Decatur.
Shair, Ira S.,	Ames,	Story.
Shannon, J. S.,	Ames,	Story.
Sharp, Irwin S.,	McClelland,	Pottawattamie.
Sheehan, D. F.,	Osage,	Mitchell.
Shekleton, Jerome,	Lawler,	Chickasaw.
Sherer, Carl,	Council Bluffs,	Pottawattamie.
Sheriff, H. J.,	Orient,	Adair.
Shetterly, Otis W.,	Hartford,	Warren.
Shipman, Elmer,	Wapello,	Louisa.
Shivvers, L. C.,	Knoxville,	Marion.
Shoemaker, Will,	Corning,	Adams.
Shumway, Loren F.,	State Center,	Marshall.
Sich, Alfred,	Reinbeck,	Grundy.
Simmett, S. T.,	Muscatine,	Muscatine.
Sipherd, Webb M.,	Grand River,	Decatur.
Skaalure, Christ J.,	Stanhope,	Hamilton.
Skiye, Ole,	Goldfield,	Humboldt.
Skyles, H. A.,	Montrose,	Lee.
Smith, A. M.,	Nemaha,	Sac.
Smith, Perry G.,	Spalding,	*Nebraska.*
Smith, Ralph B.,	Creston,	Union.
Smith, Ryman J.,	Van Meter,	Dallas.
Smith, Wm. D., Jr.,	Odebolt,	Sac.
Snyder, Oscar,	Jefferson,	Greene.
Soenke, Fred H.,	Walcott,	Scott.
Sonksen, Julius,	Stratford,	Hamilton.
Soseman, Ray,	What Cheer,	Keokuk.
Stanfield, Perry,	Auburn,	Calhoun.
Stewart, C. L.,	Adelphi,	Polk.
Stewart, Orson,	Ida Grove,	Ida.
Steinbaigh, Albert,	Dorchester,	Allamakee.
St. John, Chas.,	Des Moines,	Polk.
Stoller, W. D.,	Vinton,	Benton.
Stout, Lewis,	Stanhope,	Hamilton.
Streit, Nick,	Ashton,	Osceola.
Strohbehn, Carl,	Reinbeck,	Grundy.
Stromberg, Ernest,	Otho,	Webster.
Sullivan, Ed. F.,	Afton,	Union.
Sullivan, M. F.,	Iowa City,	Johnson.
Swan, K. L.,	Creston,	Union.
Swan, W. H.,	Creston,	Union.
Switzer, C. C.,	Carlisle,	Warren.
Tallman, Arthur,	Paton,	Greene.
Terry, B. Z.,	Chicago,	*Illinois.*
Tharp, Ray C.,	Albia,	Monroe.
Thompson, Chester H.,	Nevada,	Story.
Thompson, Milton O.,	Franklin,	*Minnesota.*

Thompson, Sherman,	Ankeny,	Polk.
Tinker, Harry,	Brooklyn,	Poweshiek.
Tittsworth, Wm. D.,	Avoca,	Pottawattamie.
Toman, Fred J.,	Diagonal,	Ringgold.
Tonsfeldt, August,	Remsen,	Plymouth.
Tostenson, L. O.,	Des Moines,	Polk.
Toureswick, M. C.,	Story City,	Story.
Townsend, Robert,	Ashton,	Osceola.
Tracy, Gilbert E.,	Nashua,	Chickasaw.
Trevor, Thomas,	Walker,	Buchanan.
Trindle, Garfield,	Van Meter,	Dallas.
Trowbridge, Chas. A.,	Des Moines,	Polk.
Trussell, Milo E.,	Albia,	Monroe.
Turin, Albin L.,	Kiron,	Crawford.
Turner, Asa,	Farrar,	Polk.
Tuttle, C. E.,	Cedar Rapids,	Linn.
Tway, Willie,	Osceola,	Clarke.
Ufford, O. C.,	Ames,	Story.
Ullrich, Arthur,	Atlantic,	Cass.
Ure, R. E.,	New Hampton,	Chickasaw.
Van Vlack, Earl W.,	Shellrock,	Butler.
Vardaman, F. E.,	Braddyville,	Page.
Veatch, E. C.,	Liscomb,	Marshall.
Verploeg, Jno. H.,	Pella,	Marion.
Ver Steeg, John H.,	Pella,	Marion.
Vincent, Jas.,	Shenandoah,	Page.
Von Glan, H. G.,	Breda,	Carroll.
Wagner, George G.,	Northwood,	Worth.
Walker, H. L.,	Washington,	Washington.
Walker, M. B.,	Clarinda,	Page.
Walsh, R. D.,	Adair,	Adair.
Walters, William,	Dow City,	Crawford.
Waltz, Earl R.,	Spalding,	Adair.
Warburton, Carrie,	Independence,	Buchanan.
Ward, R. Given,	Marshalltown,	Marshall.
Warden, Robert P.,	Melbourne,	Marshall.
Warner, V. G.,	Bloomfield,	Davis.
Watters, Raleigh,	Hudson,	Blackhawk.
Weiser, E. T.,	Grimes,	Polk.
Wellman, D. C.,	Monona,	Clayton.
Wells, R. C.,	Keota,	Washington.
Werner, Samuel,	Brooklyn,	Poweshiek.
Werts, Orval G.,	Russell,	Lucas.
West, W. B.,	Humboldt,	Humboldt.
West, Mrs. W. B.,	Humboldt,	Humboldt.
Westlay, Roy O.,	Panora,	Guthrie.
Westre, B. O.,	Jewell Junction,	Hamilton.
Wetteland, Thurman,	Ames,	Story.
Weyrauch, W. E.,	Ankeny,	Polk.
White, R. P.,	Iowa City,	Johnson.
Whitesell, Elmer,	Paton,	Greene.
Whitson, Geo. P.,	Neola,	Pottawattamie.
Whyte, Word E.,	Cushing,	Woodberry.
Wildman, Russell,	Corwith,	Hancock.
Wilken, Henry,	West Side,	Crawford.
Wilkinson, Ralph,	Gowrie,	Webster.
Williams, Arthur,	Shambaugh,	Page.
Williams, Carl,	Iowa City,	Johnson.

ENROLLMENT FOR SHORT COURSE IN BUTTERMAKING.

NAME	TOWN	COUNTY
Ady, A. H.,	Prescott,	Adams.
Anderson, C. O.,	Welcome,	*Minnesota.*
Anderson, Floyd F.,	Arlington,	Fayette.
Banwart, E. L.,	Lamar,	*Missouri.*
Beck, J. W.,	Goldfield,	Wright.
Brownlee, B. O.,	Kanawha,	Hancock.
Burditt, Geo. S.,	Osage,	Mitchell.
Capper, O. C.,	Rogers,	Linn.
Christensen, M. C.,	Kirkman,	Shelby.
Clark, C.,	Slater,	Story.
Clarke, T. A.,	West Branch,	Palo Alto.
Cline, Warren E.,	Nemaha,	Sac.
Crocker, H. M.,	Clarksville,	Butler.
Day, Clarence A.,	Ottawa,	*Kansas.*
Dencker, P. N.,	Fort Dodge,	Webster.
Dibrell, Harvey E.,	Seguin,	*Texas.*
Dolezal, Frank J.,	Ely,	Linn.
DuShane, Geo. H.,	Osage,	Mitchell.
Flickinger, L. L.,	Fredericksburg,	Chickasaw.
Forrester, H. E.,	Fredericksburg,	Chickasaw.
Gillilan, F. D.,	Central City,	Linn.
Graham, E. J.,	Colman,	*South Dakota.* . .
Hanks, A. W.,	Guthrie Center,	Guthrie.
Harvey, U. A.,	LaPorte,	Blackhawk.
Hiett, Earl A.,	Fairmont,	*Minnesota.*
Hyde, Frank C.,	Tulare,	*California.*
Jenson, E. A.,	Scarville,	Winnebago.
Johnson, J. A.,	Fertile,	Worth.
Kane, Ed.,	Alden.	Hardin.
Klopp, L. C.,	Bedford,	Taylor.
Knudson, L. O.,	Manly,	Worth.
Knudson, N. H.,	Mason City,	Cerro Gordo.
Knutson, Henry,	Radcliffe,	Hardin.
Lamoree, E. C.,	Van Wert,	Decatur.
Lewis, Reece,	Dedham,	Carroll.
Leverick, A. R.,	Billings,	*Montana.*
Louber, John R.,	Menominee	*Wisconsin.*
Mausager, M. J.,	Steamboat Rock,	Hardin.
Newman, J. H.,	Cedar Rapids,	Linn.
Nurell, C. A.,	Irvington,	Kossuth.
Olsen, Chris,	Linn Grove,	Buena Vista.
O'Neil, Ira,	Clarion,	Wright.
Peterson, Theo. A.,	Charles City,	Floyd.
Ryan, Joe,	Adair,	Adair.
Schultz, A. F.,	Manchester,	Delaware.
Scoles, Roy,	Nashua,	Chickasaw.
Shaunce, G. T.,	State Center,	Marshall.
Sorenson, Charles,	Fenton	Kossuth.
Sorenson, M. M.,	Superior,	Dickison.
Stoabs, J. F.,	Alva,	*Oklahoma.*
Street, G. W.,	Omaha,	*Nebraska.*
Suhr, Julius,	Des Moines,	Polk.
Thornberry, J. W.,	Astoria,	*Oregon.*
Vanderham, C. H.,	Belmond,	Wright.
Winter, L. H.,	Chippewa Falls,	*Wisconsin.*
Wehling, Herman,	Readlyn,	Bremer.

Windfeldt, Jens J.,	Clearfield,	Taylor.
Zorr, Emil,	Hospers,	Sioux.

ENROLLMENT FOR SHORT COURSE IN FARM DAIRYING.

NAME	TOWN	COUNTY
Beals, A. E.,	Russell,	Lucas.
Buffum, J. A.,	LeRoy,	Decatur.
Coulter, Frank M.,	Ames,	Story.
Cox, Albert,	Independence,	Buchanan.
Crary, Ralph,	Madrid,	Boone.
Dean, W. L.,	West Branch,	Cedar.
Doner, Arthur,	Lisbon,	Linn.
Ferguson, L. E.,	Laurens,	Pocahontas.
Gould, Mrs. Frank A.,	Rockwell City,	Calhoun.
Humphrey, Wm. H.,	Clear Lake,	Cerro Gordo.
Johnson, Mr. Casper,	Leland,	Winnebago.
Hodge, B. A.,	Des Moines,	Polk.
Miller, Addison,	Mount Pleasant,	Henry.
McConnell, Mrs.,	Linden.	Guthrie.
McLean, H. C.,	Marshalltown,	Marshall.
Nelson, Nels M.,	Audubon,	Audubon.
Neilson, Neils J.,	Goldfield,	Wright.
Page, Harry L.,	Sioux City,	Woodbury.
Schrader, Miner,	Britt,	Hancock.
Teague, Ray G.,	Oelwein,	Fayette.
Werts, O. G.,	Russell.	Lucas.

ENROLLMENT FOR SHORT COURSE IN DOMESTIC ECONOMY.

NAME	TOWN	COUNTY
Altes, Anna,	Mingo,	Jasper.
Armstrong, Neva D.,	Orient,	Adair.
Beals, Mrs. A. E.,	Russell,	Lucas.
Borop, Edna,	Jamaica,	Guthrie.
Butler, Adah,	Afton,	Union.
Calhoun, Blanche,		Page.
Carter, Lucia M.	Grinnell,	Poweshiek.
Collins, Mrs. E. V.,	Marshalltown,	Marshall.
Cook, Mary Hazele,	Oskaloosa,	Mahaska.
Davis, Marinda,	Clemons,	Marshall.
Day, Georgia E.,	Keosauqua,	Van Buren.
Ellis, Hattie,	Ames,	Story.
Fariday, Edith M.,	Des Moines,	Polk.
Fausch, Katie,	Ames,	Story.
Finney, Viola,	Rockwell City,	Calhoun.
Fleetwood, Blanche,	Ames,	Story.
Gobble, Mrs. L. T.,	Fairfield,	Jefferson.
Halling, Anna B.,	Orient,	Adair.
Hamm, Golda,	Shambaugh,	Page.
Haye, Miss Mary,	Hamlin.	Audubon.
Hood, Mrs. G. T.,	Rockwell City,	Calhoun.
Hoskins, L. Maud,	Cedar,	Mahaska.
Hyde, Helen M.,	Grinnell,	Poweshiek.
Kilgore, Mabel,	Creston,	Union.
Lang, Ethel,	Hough,	*Nebraska.*
Lisle, Ina,	Jamaica	Guthrie.
Marvick, Miss Lula,	Story City,	Story.

Marvick, Margretha,	Story City,	Story.
Mason, Cora,	Carlisle,	Warren.
Means, Bessie,	Sac City,	Sac.
Orr, Annie,	Independence,	Buchanan.
Person, Nora E.,	Ames,	Story.
Peters, Mabel C.,	Sac City,	Sac.
Peterson, Carrie M.,	Nevada,	Story.
Peterson, Mrs. Edward,	Stratford,	Hamilton.
Peterson, Olga V.,	Nevada,	Story.
Proudfit, Ada,	Altoona,	Polk.
Proudfit, Ora,	Altoona,	Polk.
Ross, Mrs. May,	Ames,	Story.
Smith, Candace C.,	Marshalltown,	Marshall.
Smith, Grace,	Ames,	Story.
Smith, Mattie E.,	Tabor,	Fremont.
Smith, Maude M.,	Tabor,	Fremont.
Taylor, Clara,	Grinnell,	Poweshiek.
Towne, Ethel,	Des Moines,	Polk.
Tuttle, Mrs. C. E.,	Cedar Rapids,	Linn.
Vallean, Emma,	Grinnell,	Poweshiek.
Werts, Mrs. Orval,	Russell,	Lucas.
Williams, Ethel,	Ames,	Story.

STUDENT ENROLLMENT AT IOWA STATE COLLEGE.

Course	Post Grad.	Sr.	Jr.	Soph.	Fresh.	Acad.	Spl.	Total
Agricultural	1	1		3	148	103	20	276
Agronomy	2	17	6	23			4	52
Dairy		5	4	9				18
Animal Husbandry	5	23	41	44			53	166
Horticulture and Forestry	3	5	5	6			6	25
Science and Agriculture				2			1	3
Veterinary		13	24	36	53			126
Mechanical Engineering		21	28	41	43	28	3	164
Civil Engineering		56	58	71	84	29	10	308
Electrical Engineering		39	26	55	96	54	3	273
Mining Engineering		6	6	12	18	2	2	46
Ceramics			1	1	1	1		4
General Science	3	24	19	24	32	26	14	142
Domestic Economy		4	10	20	51	28	12	125
Music					9			9
One Year Dairy							29	29
Total	14	214	228	347	535	271	157	1766

Students in College Courses	1766
Winter Short Course Students	796
Special Music Students	69
Grand Total	2631

All students having ten hours or more below Freshmen grade are classified as Academic students. In a great number of cases, however, the greater part of their work is in the Freshman year. The total number of purely Academic students would, therefore, be considerably less than the above classification would indicate.

All Freshman and Academic students in the Agricultural division are classified as Agricultural course. If they were classified in the regular courses it would greatly increase the numbers taking Agronomy, Dairy, Animal Husbandry and Horticulture and Forestry.

SUMMARY OF GRADUATES.

		1908
Number of first degrees granted 1872-1908	1995	165
PRESENT COURSES		
Animal Husbandry Course, 1904-1908	95	23
Agronomy Course, 1905-1908	33	9
Horticultural Course, 1904-1908	18	5
Dairying Course, 1904-1908	20	4
Science and Agriculture Course, 1908	1	0
Veterinary, 1880-1908	167	14
Mechanical Engineering Course, 1872-1908	185	21
Civil Engineering Course, 1872-1908	296	32
Electrical Engineering Course, 1892-1908	226	31
Mining Engineering Course, 1897-1908	20	1
Science Course, as related to the Industries, 1875-1908	405	6
Domestice Science Course, 1908	6	4
General and Domestic Science Course, 1901-1908	78	15
COURSES DISCONTINUED		
Agricultural Course, leading to Degree B. S., 1872-1880	102	
Agricultural Course, leading to Degree B. S. A., 1883-1888 and 1899-1904	86	
Science and Agriculture Course, leading to Degree B. S., 1889-1890	45	
General Science Course for Ladies, 1872-1880 and 1904	48	
General and Domestic Science Course, leading to Degree of B. L., 1887-1899	93	
General and Domestic Science Course, leading to Degree of B. Ph., 1899-1900	21	
Agronomy Course, leading to Degree B. Ag., 1891-1898	50	
	1995	165

		1908
Higher Degrees, 1872-1908	120	13
Master of Scientific Agriculture	38	2
Master of Science	34	2
Other Masters' Degrees	11	
Engineers	24	8
Honorary Degrees	9	1
Advanced Degrees in Veterinary	4	

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Vol. VIII. BULLETIN No. 5

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OF
AGRICULTURE and
MECHANIC ARTS

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FEBRUARY, 1910
AMES, IOWA

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¶ Separate announcements of the Engineering, Agricultural and Veterinary Divisions as well as the College Catalogue and Short Course announcements will be sent gratuitously to any one wishing them. In calling for announcements, please state the Division concerning which information is desired. Address all communications to A. B. Storms, President, Iowa State College, Ames, Iowa. : : : : : : :

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CALENDAR 1910-1911

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Calendar

1909-1910.

SECOND SEMESTER.

January 18-19, Tuesday and Wednesday	Entrance Examinations.
January 20-22, Thursday, 1:30 P. M., to Saturday, 5:00 P. M.	Registration-Classification Days.
January 24, Monday, 7:40 A. M.	College Work begins.
January 29, Saturday, 8:00 P. M.	Joint Y. M. C. A. and Y. W. C. A. Reception.
March 1, Tuesday	Selection of Senior Honor Students.
March 5, Saturday, 8:00 P. M.	Freshman-Sophomore Annual.
March 30, Wednesday, 5:00 P. M.	Easter Vacation begins.
April 4, Monday, 7:00 P. M.	Easter Vacation closes.
April 8, Friday, 8:00 P. M.	Inter-society Declamatory Contest.
May 2, Monday	Recommendation of Candidates for Graduation.
May 14, Saturday	Last Date for Examination of Candidates for Master's Degree.
May 25, Wednesday	Last Day for Presenting Theses to Thesis Committee.
May 28, Saturday	Missouri Valley Conference Field Meet, Des Moines.
May 30, Monday	Memorial Day.
June 4, Saturday	Civil and Mining Engineers go into Summer Camp.
June 4, Saturday, 8:00 P. M.	Semester Musical Recital.
June 5, Sunday, 10:30 A. M.	Baccalaureate Sermon.
June 5, Sunday, 8:00 P. M.	Address before the Christian Associations.
June 6, Monday, 2:30 P. M.	Graduation Exercises of Literary Societies.
June 6, Monday, 8:00 P. M.	Junior Class Play.
June 7, Tuesday, 2:30 P. M.	Senior Class Day Exercises.
June 7, Tuesday, 8:00 P. M.	Grand Concert.
June 8, Wednesday, 7:30 A. M.	Senior Breakfast.
June 8, Wednesday	Alumni Business Meeting.

June 9, Thursday, 10:30 A. M.	Commencement Address and Presentation of Diplomas.
June 9, Thursday, 1:00 P. M.	Alumni and Faculty Banquet.
June 10, Friday.	Summer Vacation begins.

1910-1911.

FIRST SEMESTER.

August 30-31, Tuesday and Wednesday	Entrance Examinations.
September 1, Thursday, 1:30 P. M.	First Semester begins.
September 1-3, Thursday, 1:30 P. M., to Saturday, 5:00 P. M.	Registration-Classification Days.
September 5, Monday, 7:40 A. M.	College Work begins.
September 10, Saturday, 8:00 P. M.	Y. M. C. A. and Y. W. C. A. Reception.
October 1, Saturday, 8:00 P. M.	Junior Trot.
October 3, Monday	Last Date of Presentation of Subjects for Bachelor's Degree.
October 15, Saturday, 8:00 P. M.	Sophomore-Freshman Annual.
November 24-26, Thursday to Saturday	Thanksgiving Vacation.
December 20-21, Tuesday and Wednesday	Semester Examinations.
December 21, Wednesday, 5:00 P. M.	College Work closes.

1910-1911.

January 2-14, Monday to Saturday	Special Short Courses in Agriculture and Domestic Economy.

1910-1911.

SECOND SEMESTER.

January 17-18, Tuesday and Wednesday	Entrance Examinations.
January 19-21, Thursday, 1:30 P. M., to Saturday, 5:00 P. M.	Registration-Classification Days.
June 8, Thursday	Second Semester closes.

State Board of Education of Iowa

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GENERAL OFFICERS.

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Room 104 Central Building.

EDGAR WILLIAMS STANTON, LL. D......Secretary of the Colleg
Room 117 Central Building.

HERMAN KNAPP, B. S. A..................Treasurer and Registra
Room 122 Central Building.

MISS VINA ELETHE CLARK............................Libraria
Morrill Hall.

ORANGE HOWARD CESSNA, D. D......................Chaplai
Room 212 Central Building.

*THOMAS SLOSS............Superintendent of Buildings and Ground
Custodian's Office.

CHARLES G. TILDEN, M. D....College Physician and Sanitary Office
Hospital Building.

DEANS AND VICE DEANS.

ALBERT BOYNTON STORMS, LL. D..Dean of the Division of Scienc
Room 104 Central Building.

EDGAR WILLIAMS STANTON, LL. D....Dean of the Junior College
Room 117 Central Building.

CHARLES FRANKLIN CURTISS, M. S. A., D. S..Dean of the Division of Agricultur
Room 124 Hall of Agriculture.

ANSON MARSTON, C. E.........Dean of the Division of Engineering
Room 315 Engineering Hall.

CHARLES HENRY STANGE, D. V. M......Dean of the Division of Veterinary Medicine
Second Floor, Agricultural Engineering Building.

*MRS. MARIAN H. KILBOURNE, B. L..............Dean of Women
*Leave of absence on Carnegie Foundation.

SPENCER AMBROSE BEACH, B. S. A., M. S......Vice Dean of the Division of Agriculture
Room 201 Hall of Agriculture.

SAMUEL WALKER BEYER, Ph. D........Vice Dean of Division of Engineering
Room 303 Engineering Hall.

MARIA M. ROBERTS, B. L..........Vice Dean of the Junior College
Room 218 Central Building.

MRS. EMILY CUNNINGHAM................................Matron
Margaret Hall.

AGRICULTURAL EXPERIMENT STATION.

CHARLES FRANKLIN CURTISS, M. S. A., D. S...............Director
Room 124 Hall of Agriculture.

WILLARD JOHN KENNEDY, B. S. A...................Vice Director
Room 103 Hall of Agriculture.

ENGINEERING EXPERIMENT STATION.

ANSON MARSTON, C. E......................................Director
Room 315 Engineering Hall.

FACULTY ORGANIZATION.

ALBERT BOYNTON STORMS, LL. D........President, Chairman of Scholarship and Public Grounds Committees
Room 105 Central Building.

HERMAN KNAPP, B. S. A....Secretary of the Faculty, Chairman of Committee on Catalogue
Room 122 Central Building.

EDGAR WILLIAMS STANTON, LL. D....Chairman of Committee on Course of Study
Room 117 Central Building.

CHARLES FRANKLIN CURTISS, M. S. A., D. S....Chairman of Committee on Library
Room 124 Hall of Agriculture.

ALFRED ALLEN BENNETT, M. S........Chairman of Committee on Examinations and Standings
Chemical Hall.

LOUIS HERMANN PAMMEL, Ph. D. .....Chairman of Committee on Theses
Room 314 Central Building.

LOUIS BEVIER SPINNEY, M. S....Chairman of Committee on Rules
Room 212 Engineering Hall.

SAMUEL WALKER BEYER, Ph. D......Chairman of Committee on Athletics
Room 203 Engineering Hall.

HENRY ELIJAH SUMMERS, B. S....Chairman of Committee on Post Graduate Study
First Floor, Morrill Hall.

ASHLEY VAN STORM, Ph. B....Chairman of Committee on Entrance Requirements and Secondary Schools
Room 103 Central Building.

ARTHUR MACMURRAY, B. A., M. O..Chairman of Literary Societies and Student Conference Committees
Room 311½ Central Building.

LOLA A. PLACEWAY, B. S....Chairman of Committee on Time Table
Second Floor, Chemical Hall.

FRED ALAN FISH, M. E. in E. E..Chairman of Committee on General Faculty Meetings and Social Affairs
Room 212 Engineering Hall.

ORANGE HOWARD CESSNA, D. D., A. M..Chairman of Committee on Moral Welfare
Room 212 Central Building.

MRS. EMILY CUNNINGHAM....Chairman of Committee on Student Social Life
Margaret Hall.

SPENCER AMBROSE BEACH, B. S. A., M. S..Chairman of Committee on Student Home Life
Room 201 Hall of Agriculture.

CHARLES G. TILDEN, M. D......Chairman of Committee on Sanitary Conditions and General Health
College Hospital.

Officers of Instruction

THE FACULTY.

ALBERT BOYNTON STORMS. *1903..President, Dean of the Division of Science
B. A., Michigan, 1884; A. M., 1893; D. D., Lawrence, 1899; LL. D., Drake, 1903.

EDGAR WILLIAMS STANTON. 1877, 1874..Dean of Junior College, Professor of Mathematics
B. Sc., Iowa State College, 1872; M. Sc., 1887; LL. D., Coe, 1904.

CHARLES FRANKLIN CURTISS. 1897, 1891..Dean of the Division of Agriculture, Director of Experiment Station
B. S. A., Iowa State College, 1887; M. S. A., Iowa State College, 1892; D. Sc. in Agriculture, Michigan Agricultural College, 1907.

ANSON MARSTON. 1892..Dean of Division of Engineering, Professor of Civil Engineering
B. C. E., Cornell University, 1889.

CHARLES HENRY STANGE. 1909..Dean of the Division of Veterinary Medicine, Professor of Theory and Practice and Therapeutics, 1909
D. V. M., Iowa State College, 1907.

HONORABLE JAMES WILSON. 1902, 1891...Lecturer in Agriculture
M. S. A., Iowa State College, 1907.

GENERAL JAMES RUSH LINCOLN. 1884, 1883..Professor of Military Science

ALFRED ALLEN BENNETT. 1885...........Professor of Chemistry
B. Sc., Michigan, 1877; M. Sc., Iowa State College, 1888.

HERMAN KNAPP. 1887, 1883.............................Registrar
B. S. A., Iowa State College, 1883.

LOUIS HERMANN PAMMEL. 1889..............Professor of Botany
B. Agr., Wisconsin, 1885; M. S., 1889; Ph. D., Washington, St. Louis, 1898.

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*First date after the name indicates date of appointment to present position, the second date, when the first fails to do so, indicates the date of first appointment in the College.

LOUIS BEVIER SPINNEY. 1897, 1891......Professor of Physics and Illuminating Engineering
B. M. E., Iowa State College, 1892; B. S. (E. E.), 1893.

SAMUEL WALKER BEYER. 1898, 1891..Vice Dean of Division of Engineering, Professor of Geology and Mining Engineering.
B. S., Iowa State College, 1889; Ph. D., Johns Hopkins, 1895.

ALVIN BUELL NOBLE. 1898....Professor of Rhetoric and Literature
B. Ph., University of Iowa, 1887.

HENRY ELIJAH SUMMERS. 1898............Professor of Zoology
B. S., Cornell University, 1886.

ORANGE HOWARD CESSNA. 1900........Professor of History and Psychology
B. S., Iowa State College, 1872; B. D., Garrett Biblical Institute, 1885; D. D., 1900; A. M., Cornell College, 1901.

WILLARD JOHN KENNEDY. 1901...Professor of Animal Husbandry
B. S. A., Iowa State College, 1899.

WILLIAM HENRY STEVENSON. 1903, 1902.......Professor of Soils
A. B., Illinois College, 1893; B. S. A., Iowa State College, 1905.

SPENCER AMBROSE BEACH. 1905....Vice Dean of the Division of Agriculture, Professor of Horticulture
B. S. A., Iowa State College, 1887; M. S., Iowa State College, 1892.

BENJAMIN HORACE HIBBARD. 1906, 1902..Professor of Economic and Political Science
B. S. A., Iowa State College, 1898; Ph. D., Wisconsin, 1902.

WARREN H. MEEKER. 1907, 1891..........Professor of Mechanical Engineering
M. E., Cornell University, 1891.

FRED ALAN FISH. 1907, 1905....Professor of Electrical Engineering
M. E. in E. E., Wisconsin, 1904.

JAY BROWNLEE DAVIDSON. 1907, 1905..Professor of Agricultural Engineering
B. S., M. E., Nebraska, 1904.

MRS. ALICE DYNES FEULING. 1907..Professor of Domestic Economy
B. S., Chicago, 1900.

ARTHUR MACMURRAY. 1908..........Professor of Public Speaking
A. B., Kansas, 1896; M. O., Ott School of Expression, Chicago, 1904.

ROBERT EARLE BUCHANAN. 1909, 1904..Professor of Bacteriology
B. S., Iowa State College, 1904; M. S., Iowa State College, 1906; Ph. D., Chicago, 1908.

RALPH R. DYKSTRA. 1909, 1905..Professor of Anatomy and Obstetrics
D. V. M., Iowa State College, 1905.

FLETCHER BRIGGS. 1909..........Professor of Modern Languages
Ph. B., Iowa, 1901; M. A., 1902.

HAROLD DE MOTT HUGHES. 1910........Professor of Farm Crops
B. S., University of Illinois, 1907; M. S. A., University of Missouri, 1908.

MARIA M. ROBERTS. 1904, 1891.......Vice Dean of Junior College, Associate Professor of Mathematics
B. L., Iowa State College, 1890.

ARTHUR THOMAS ERWIN. 1904, 1900......Associate Professor of Horticulture
B. S., Arkansas, 1899; M. S. A., Iowa State College, 1902.

LOLA ANNE PLACEWAY. 1905, 1896.Associate Professor of Chemistry
B. S., Iowa State College, 1895.

VINA ELETHE CLARK. 1897.............................Librarian

JOHN PIPER WATSON. 1904.........................Physical Director

CHARLES BEECHER STANTON. 1907..Associate Professor of Railway Engineering
C. E., Rensselaer Polytechnic Institute, 1903.

IRA ABRAHAM WILLIAMS. 1907, 1898.Associate Professor of Geology and Mining Engineering
B. S., Iowa State College, 1898; M. S., Iowa State College, 1903; A. M., Columbia, 1904.

JOHN EDWARD KIRKHAM. 1907..Associate Professor of Structural Engineering
B. S., in C. E., Missouri, 1895.

WINFRED FORREST COOVER. 1907, 1904..Associate Professor of Chemistry
A. B., Otterbein University; A. M., Ohio State University.

WAYNE DINSMORE. 1907..Associate Professor of Animal Husbandry
B. S. A., Iowa State College, 1904.

LAURENCE C. HODSON. 1907, 1906..Associate Professor of Mining Engineering
B. C. E., 1898; E. M., Michigan College of Mines, 1901.

CHARLES ANDERSON SCOTT. 1908..Associate Professor of Forestry
B. S. A., Kansas Agricultural College, 1901.

ELIZABETH MACLEAN. 1908, 1899...Associate Professor of English
B. Di., State Normal, Iowa, 1894; M. Di., 1900; B. Ph., Chicago, 1909.

MARK PERKINS CLEGHORN. 1908, 1902....Associate Professor of Mechanical Engineering
B. S. in E. E., 1902, Iowa State College, M. E., 1907.

ADOLPH SHANE. 1908, 1904........Associate Professor of Electrical Engineering
B. S. in E. E., Nebraska, 1901; E. E., Iowa State College, 1908.

CHARLES CURTIS MAJOR. 1908..Associate Professor of Mechanical Engineering
M. E., Blomsburg Normal School, Pa., 1891; M. E., Cornell University, 1898.

MARTIN MORTENSEN. 1908........Associate Professor of Dairying
B. S. A., Iowa State College, 1909.

WILLIAM MILTON BARR. 1909..Associate Professor, Metallurgy in Mining Engineering
B. S., Iowa, 1902; A. M., Grinnell, 1904; Ph. D., in Chemistry, Pennsylvania, 1908.

WILLIAM WALLACE DIMOCK. 1909..Associate Professor, Veterinary Medicine
B. Agr., Connecticut Agricultural College, 1901; D. V. M., Cornell University; D. V. M., University of Habana, 1907.

ASSISTANT PROFESSORS.

ALEXANDER STEWART THOMPSON. 1907..Director of Music, Piano, Pipe Organ and Voice
Royal College, London; Guild Hall School of Music, London.

CLARA DUTTON-THOMPSON. 1907..Vice-Director Voice, Preparatory Piano and Organ
Cazenovia Seminary; Guild Hall School of Music.

JOSEPH EDWARD GUTHRIE. 1904, 1902....Assistant Professor of Zoology
B. S., Minnesota, 1900; M. S., 1901.

THOMAS HARRIS McDONALD. 1905, 1904...Assistant Professor, Civil Engineering in Charge of Good Road Investigations
B. C. E., Iowa State College, 1904.

ERNEST ALANSON PATTENGILL. 1906, 1900...Assistant Professor of Mathematics
B. S., Iowa State College, 1897; B. S., Cornell University, 1899.

JULIA TRUEMAN COLPITTS. 1906, 1900.....Assistant Professor of Mathematics
A. B., Mount Allison University, Canada, 1899; A. M., Cornell University, 1900.

LOUIS BERNARD SCHMIDT. 1906....Assistant Professor of History
Ph. B., Cornell College, 1901; A. M., 1906.

ROY A. NORMAN. 1907..Assistant Professor of Mechanical Engineering
B. M. E., Iowa State College, 1903; M. E., Iowa State College, 1909.

HOWARD CARLTON FORD. 1907..Assistant Professor, Surveying and Irrigation
B. S. (C. E.), Colorado, 1904; M. S., 1905; C. E., 1907.

ARTHUR HENRY HOFFMAN. 1907, 1905....Assistant Professor of Physics
A. B., Iowa Wesleyan, 1897; A. M., 1905; B. S. in E. E., Iowa State College, 1905.

WILLIAM BALLENTYNE ANDERSON. 1907, 1905..Assistant Professor of Physics
B. S., Wisconsin, 1901; M. S., 1903; Ph. D., 1906.

ELIZABETH MOORE. 1908, 1904.......Assistant Professor of English
Ph. B., Iowa College, 1900; Ph. M., Chicago, 1902.

SYBIL M. LENTNER. 1908, 1904..Assistant Professor of Public Speaking
B. S., Iowa State College, 1900.

WINNIFRED RICHARDS TILDEN. 1908, 1904....Physical Directress
B. A., Mount Holyoke, 1904.

CAROLYN GRIMSBY. 1908, 1905................Reference Librarian
B. S., Iowa State College, 1905.

DORA GILBERT TOMPKINS. 1908, 1905.....Assistant Professor of English
A. B., Monmouth College, 1893; A. M., Knox College, 1898.

JULIA RAMSEY VAULX. 1908, 1906..Assistant Professor of English
A. B., Arkansas, 1894; A. M., Cornell University, 1897.

HOWARD CASTNER PIERCE. 1908, 1906....Assistant Professor of Animal Husbandry, in Charge of Poultry
B. S. A., Cornell University, 1907.

ROY HIRAM PORTER. 1908, 1906....Assistant Professor, Mechanical Engineering
B. M. E., Maine, 1906.

*M. I. EVINGER. 1908, 1906..Assistant Professor of Civil Engineering
B. C. E., Iowa State College, 1906.

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*One year leave of absence.

HENRY GOUGH BELL. 1908, 1907..Assistant Professor of Farm Crops
B. S. A., Ontario, Agricultural College, 1905.

BRUCE WILLIAM CROSSLEY. 1908, 1907....Assistant Professor of Farm Crops
B. S. A., Iowa State College, 1907.

JOHN EDWIN BRINDLEY. 1908, 1907........Assistant Professor of Economic Science
B. L., Wisconsin, 1902; A. M., 1906.

HAROLD EDWARD BEMIS. 1908..Assistant Professor of Veterinary Science
D. V. M., Iowa State College, 1908.

ESTELLE FOGLE-BUCHANAN. 1909, 1904....Assistant Professor of Botany
A. B., Parsons College, 1899; B. S., Iowa State College, 1903; M. S., Iowa State College, 1908.

C. E. BARTHOLOMEW. 1909, 1904..Assistant Professor of Entomology
B. S., Iowa State College, 1904; M. S.

WILLIAM RANDOLPH RAYMOND. 1909, 1907..Assistant Professor of English
A. B., Grinnell, 1894.

EVERETT WALTER HAMILTON. 1909, 1907..Assistant Professor of Agricultural Engineering
B. S. A., Iowa State College, 1907.

EDWARD NORRIS WENTWORTH. 1909, 1907..Assistant Professor of Animal Husbandry
B. S. A., Iowa State College, 1907; M. S. A., Iowa State College, 1909.

ROY WINCHESTER CRUM. 1909, 1907..Acting Assistant Professor of Civil Engineering
B. C. E., Iowa State College, 1907.

JOSEPH FREDERICK BARKER. 1909, 1908..Assistant Professor of Soils
B. S. A., Ohio, 1908.

HARRY WOY GRAY. 1909..Assistant Professor of Civil Engineering
B. C. E., Iowa State College, 1906.

WILLIAM HARPER PEW. 1909.......Assistant Professor of Animal Husbandry
B. S. A., Iowa State College, 1907.

IRA G. McBETH. 1909.........Assistant Professor of Soil Bacteriology
B. S. A., Ohio, 1907; M. A., 1908.

HOWARD SYLVESTER MURPHEY. 1909.....Assistant Professor of Veterinary Medicine
D. V. M., Ohio, 1908.

LULU GRAVES. 1909.........Assistant Professor of Domestic Science
B. Ed., Chicago, 1908.

ROY EVERETT ROUDEBUSH. 1909..Assistant Professor of Mechanical Engineering
A. B., Indiana, 1903; M. E., Cornell University, 1907.

ARCHIBALD LEITCH. 1909..Assistant Professor of Animal Husbandry in Charge of Dairy Farm
B. S. A., Ontario Agricultural College, 1905.

JOHN HAROLD GORDON. 1909.........Assistant Professor of Dairy Bacteriology
B. S. in Agr., Missouri, 1909.

GILBERT T. GUTHRIE. 1909........Assistant Professor of Dairying
B. S. A., Iowa State College, 1909.

LELIA PURDY. 1909............Assistant Professor of Domestic Art

INSTRUCTORS.

EZRA CORNELIUS POTTER........Instructor in Pattern Shop, 1898
ANNIE WILSON FLEMING, B. S....Instructor in Mathematics, 1900
GRACE ISABEL NORTON, B. A...........Instructor in German, 1901
WARD MURRAY JONES, B. C. E......Instructor in Mathematics, 1902
JESSE GREENLEAF HUMMEL, B. M. E.Instructor in Machine Shop, 1903
EDWARD MERRITT SPANGLER......Instructor in Pattern Shop, 1905, 1904
ETHYL BURR CESSNA, B. S........Instructor in History, 1905, 1904
CHARLES ELMER ELLIS, M. S. A..Instructor in Ceramics, 1906, 1903
LOLA STEPHENS, B. S...........Instructor in Chemistry, 1906, 1905
LAURA MAY TAGGART, B. S.....Instructor in Chemistry, 1907, 1906
MABEL CAMPBELL, B. S., B. D. S..Instructor in Domestic Science, 1907, 1906
LOUISE PETERS, A. M......Instructor in German and Spanish, 1907
INGEBORG G. LOMMEN, M. L............Instructor in German, 1907
WILLIAM KUNERTH, A. B................Instructor in Physics, 1907
HELEN FLORENCE SMITH, A. B....Instructor in Mathematics, 1907
FREDERICKA VON TRICE SHATTUCK, B. A..Instructor in Public Speaking, 1907
JOSEPH B. VARELA.........Instructor in Mechanical Drawing, 1907
JOHN THAXTER BATES, B. M. E..Instructor in Mechanical Engineering, 1908, 1907
JAMES WILLIAM CAMERON...Instructor in Forge Work, 1908, 1907

JOHN A. SAWIN....................Instructor in Foundry, 1908, 1907
AGNES GINA MOSHER, M. S........Instructor in Mathematics, 1908
CARRIE C. WATTERS, B. A..............Instructor in History, 1908
MRS. MARY PETERS FAIRFIELD, B. A...Instructor in French, 1908
MRS. MARGARET ALISON ARVILLE, A. B..Instructor in Spanish and French, 1908
MARY MAKEPEACE MORRIS, Ph. B.....Instructor in English, 1908
MARIE ZIMMERMAN, A. B..............Instructor in German, 1908
RUTH BOGARDUS SAFFORD, B. L......Instructor in English, 1908
MYRICK WHITING PULLEN, B. S. in E. E...Instructor in Electrical Engineering, 1908
HENRY NESS, B. S. A...............Instructor in Zoology, 1909, 1906
ROYAL EDGAR JEFFS, B. S. A......Instructor in Botany, 1909, 1907
ADDISON HERBERT CHADSEY.......Instructor in Dairy, 1909, 1907
DANIEL WILLIS SYLVESTER..Instructor in Agricultural Engineering, 1909, 1908
CHARLES OSMOND ALEXANDER, B. M. E..Instructor in Agricultural Engineering, 1909, 1908
CHARLES MURRAY, B. Pe......Instructor in Bacteriology, 1909, 1908
ROY EUGENE SMITH, B. S. A...............Instructor in Soils, 1909
ELMER VERNON GRIGGS, B. S. in E. E., B. M. E......Instructor in Mathematics, 1909
VIVIAN DANGERFIELD BEARD, B. C. E..Instructor in Civil Engineering, 1909
ROGER SHERMAN MACINTOSH, B. S. A..Instructor in Horticulture, 1909
CHARLES ALTON BAUGHMAN.Instructor in Civil Engineering, 1909
HERBERT JOHN PLAGGE, B. S..Instructor in Physics and Illuminating Engineering, 1909
ESTHER LEIPER COOPER, Ph. B........Instructor in English, 1909
FRANK LEWIS ODELL....................Instructor in Dairy, 1909
GEORGE RUPERT MACMINN, A. B.......Instructor in English, 1909
WILLIAM ALFRED BEVAN, B. S.........Instructor in Physics, 1909
FRANCIS WILBER DICKEY, A. M......Instructor in Economic and Political Science, 1909
HENRY ELLSWORTH EWING............Instructor in Zoology, 1909
INGENBORG SWENDSEN TUNE...........Instructor in Music, 1909
NORRIS EARLE MITCHELL.............Instructor in Violin, 1909
JOHN HUG, B. M. E...............Instructor in Machine Shop, 1909
N. LEERBERG............Instructor in Mechanical Engineering, 1909

RESIDENT LECTURER.

GEORGE JUDISCH.....................Lecturer in Pharmacy, 1901

ASSISTANTS.

HARRIETTE KELLOGG, A. M........Curator of the Herbarium, 1903
GEORGE MITCHELL..........................Farm Foreman, 1906

MARGARET FORGEUS, A. B.................Library Cataloguer, 1906
CHARLES L. MUNDHENK..................Brass Instruments, 1906
CAROLINE E. LAIRD..Assistant Librarian, Engineering Library, 1907
VERA MORLAN DIXON, B. S..Assistant Librarian, General Library, 1908
CLIFFORD VERNE GREGORY..Assistant in Agricultural Journalism, 1908
CHESTER CHARLES FOWLER, B. S. in Chemical Engineering..Assistant in Chemistry, 1909
JESSE McKEEN, B. S..................Assistant in Chemistry, 1909
ORIN L. KIPP, B. S.....................Assistant in Chemistry, 1909
ROBINA MARGUERITE RAE......Assistant Librarian, Agricultural Library, 1909
SOPHIE HARGIS, B. S................Assistant in Chemistry, 1909
MELLIE MORRIS SMITH........Assistant Cataloguer, Library, 1909
NELLIE NAYLOR, B. A................Assistant in Chemistry, 1909
JOHN ROY CAMPBELL, B. S. A............Assistant in Botany, 1909
JOHN REARDON.....................................Gardener, 1909
BRUCE A. COLE..Mechanician, Civil and Electrical Engineering, 1909

STUDENT ASSISTANTS.

EDNA EVERETT................Student Assistant in English, 1908
WILLIAM A. LIPPINCOTT, A. B..Student Assistant in Poultry Husbandry, 1908
C. R. SHUMWAY..................Student Assistant in Zoology, 1908
ETHEL McDONALD....Student Assistant in Domestic Economy, 1909
C. COYKENDALL.................Student Assistant in English, 1909
A. F. LUNDGREN.................Student Assistant in English, 1909
SUSIE KNUDSON............Student Assistant in Mathematics, 1909
E. S. ESTEL.....................Student Assistant in Dairying, 1909
WILLIAM E. WILBUR.............Student Assistant in English, 1909
ROY TRUAX................Student Assistant in Bacteriology, 1909
JOSEPHINE CALONKEY.....Student Assistant in Mathematics, 1909
J. E. O'LEARY..........Student Assistant in Civil Engineering, 1909
EVERETT W. LAMBERT, B. S..Graduate Assistant in Mining Engineering, 1909
R. F. MILLER, B. S. A.—Graduate Assistant in Animal Husbandry, 1909
FLORENCE ARMSTRONG................Assistant in English, 1909

Agricultural Experiment Station Staff

ALBERT BOYNTON STORMS, A. M., LL. D......President Ex-Officio
CHARLES FRANKLIN CURTISS, M. S. A., D. S............Director
WILLARD JOHN KENNEDY, B. S. A......Vice Director and Animal Husbandry
LOUIS HERMANN PAMMEL, B. Ag., M. S., Ph. D...........Botanist
HENRY ELIJAH SUMMERS, B. S....................Entomologist
WILLIAM HENRY STEVENSON, A. B., B. S. A................Soils
LOUIS G. MICHAEL, B. S..................................Chemist
SPENCER AMBROSE BEACH, B. S. A., M. S..........Horticulturist
ARTHUR THOMAS ERWIN, B. S., M. S. A....Assistant Horticulturist
JAY BROWNLEE DAVIDSON, B. S., M. S. A..Agricultural Engineering
CHARLES ANDERSON SCOTT, B. S. A..................Forester
CHARLES HENRY STANGE, D. V. M....................Veterinary
ROBERT EARLE BUCHANAN, M. S................Bacteriologist
VINA ELETHE CLARK..........................Station Librarian
MARTIN MORTENSEN, B. S. A............................Dairying
EDWIN ELIAS LITTLE, M. S. A.............Assistant Horticulturist
WILLIAM WALLACE DIMOCK, D. V. M.................Veterinary
MISS CHARLOTTE MARIA KING................Assistant in Botany
MISS HARRIETTE KELLOGG, A. M.............Assistant in Botany
MATTHEW LEANDER KING, B. M. E..Experimentalist in Agricultural Engineering
FRED ERVING COLBURN............................Photographer
HOWARD CASTNER PIERCE, B. S. A......................Poultry
IRA G. McBETH, B. S. A..............Assistant in Soil Bacteriology
LYMAN CRANE BURNETT, M. S. A.........Assistant in Farm Crops
ROBERT LORENZO WEBSTER, A. B.......Assistant in Entomology
LAURENZ GREENE, B. S. A., M. S. A......Assistant in Horticulture
ARCHIBALD LEITCH, B. S. A........Assistant in Animal Husbandry
JOHN HAROLD GORDON, B. S. in Ag............Assistant in Dairy Bacteriology
HENRY HERBERT KILDEE, B. S. A.....Experimentalist in Animal Husbandry
SAMUEL L. JODIDI, B. S., Ph. D.............Experimentalist in Soils
STELLA AGNES HARTZELL, B. Sc., A. M.........Assistant Chemist
B. A. MADSON, B. S. A..........................Assistant Chemist
SEYMOUR C. GUERNSEY, B. S. A..................Assistant Chemist
ALFRED A. WELLS, B. S........................Assistant in Soils
LEE W. FORMAN, B. S. A.............Field Superintendent in Soils
ROBINA M. RAE.......................Assistant in Station Library
CLIFFORD VERNE GREGORY.............Editor, Station Bulletins
WILLIAMS ADAMS LIPPINCOTT...............Assistant in Poultry

Engineering Experiment Station

STATION COUNCIL.

(Appointed by the State Board of Education.)

ALBERT BOYNTON STORMS, A. M., LL. D.	President
ANSON MARSTON, C. E.	Director
LOUIS BEVIER SPINNEY, B. M. E., M. S.	Professor
SAMUEL WALKER BEYER, B. S., Ph. D.	Professor
WARREN H. MEEKER, M. E.	Professor
FRED ALAN FISH, M. E. in E. E.	Professor

ENGINEERING EXPERIMENT STATION STAFF.

ALBERT BOYNTON STORMS, A. M., LL. D.	President, Ex-Officio
ANSON MARSTON, C. E.	Director and Civil Engineer
LOUIS BEVIER SPINNEY, B. M. E., M. S.	Illuminating Engineer
SAMUEL WALKER BEYER, B. S., Ph. D.	Mining Engineer
WARREN H. MEEKER, M. E.	Mechanical Engineer
FRED ALAN FISH, M. E. in E. E.	Electrical Engineer
ALFRED ALLEN BENNETT, M. S.	Chemist
WILLIAM M. BARR, B. S., M. A., Ph. D.	Industrial Chemist
C. E. ELLIS, M. S. A.	Assistant Chemist
IRA ABRAHAM WILLIAMS, M. S., A. M.	Assistant in Engineering
FRANK MORRIS OKEY, B. C. E.	Assistant Engineer

Iowa Highway Commission

ANSON MARSTON, C. E.	Director
CHARLES FRANKLIN CURTISS, M. S. A., D. S.	Director
THOMAS H. MACDONALD, B. C. E.	Highway Engineer
JAY BROWNLEE DAVIDSON, B. S., M. E.	Engineer of Road Machinery
JOHN EDWARD KIRKHAM, B. S. in C. E.	Consulting Bridge Engineer
C. S. NICHOLS	Assistant Highway Engineer

Agricultural Extension

ALBERT BOYNTON STORMS, A. M., LL. D.	President, Ex-Officio
CHARLES FRANKLIN CURTISS, M. S. A.	Dean of Agriculture, Ex-Officio

AGRICULTURAL EXTENSION STAFF.

PERRY GREELEY HOLDEN, M. S., B. Pd	Superintendent
ASHLEY VAN STORM, Ph. B	Schools
RALPH K. BLISS, B. S. A	Animal Husbandry
ADDISON H. SNYDER, B. S	Soils
MISS EDITH GRAINGER CHARLTON	Domestic Economy
MISS NEALE S. KNOWLES	Domestic Economy
GEORGE RAYMOND BLISS, B. S. A	Horticulture
H. C. PIERCE	Poultry
H. V. CALDWELL, B. S. A	Assistant in Farm Crops
HAROLD FREDERICK LUICK, B. S. A	Dairying
CHARLES C. R. BUSH, B. S. A	Animal Husbandry and Dairying
LESLIE EUGENE TROEGER, B. S. A.	Assistant in Animal Husbandry
MISS LURA PHILLIPS	Assistant in Schools
E. Y. CABLE	Student Assistant in Agricultural Engineering

Organization and History

The laws of the State of Iowa provide for the management and control of the State College of Agriculture and Mechanic Arts by the State Board of Education. This board consists of nine men nominated by the Governor and confirmed by the Senate. This Board appoints a Finance Committee consisting of three men who give their entire time to the management and control of the three state institutions of Iowa, under such rules and regulations as the State Board of Education may prescribe.

The act establishing "A State Agricultural College and Model Farm" to be connected with the entire agricultural interests of the State was passed by the Legislature of Iowa in 1858. This legislature also appointed a board of commissioners to buy a farm and erect a college building, and elected a board of trustees to select a faculty and organize a college.

In 1859 a farm of six hundred and forty acres situated near Ames was purchased for the use of the college.

In 1862 a bill was passed by Congress, entitled, "An act donating public lands to the several States and Territories, which may provide colleges for the benefit of Agriculture and the Mechanic Arts."

Section 1 of this act provides that for the support of such colleges there be granted "an amount of public land, to be apportioned to each State in quantity equal to thirty thousand acres for each Senator and Representative in Congress to which the States are respectively entitled by the apportionment under the census of 1860; provided that no mineral lands shall be selected or purchased under the provisions of this act."

Section 4 requires: "That all moneys derived from the sale of land aforesaid by the States to which lands are apportioned, and from the sale of land script, hereinbefore provided for, shall constitute a perpetual fund, the capital of which shall remain forever undiminished (except as may be provided for in Section fifth of this act), and the interest of which shall inviolably be apportioned by each State which may take and claim the benefit of this act, to the endowment, support and maintenance of at least one college, where the leading object shall be, without excluding other scientific and classical studies, and including military tactics, to teach such branches of learning as are related to agriculture and the mechanic arts, in such manner as the Legislature of the State may provide, in order to promote the liberal and practical education of the industrial classes in the several pursuits and professions of life."

Section 5 says: "And be it further enacted, that the grant of land and land script hereby authorized, shall be made on the following conditions, to which, as well as the provisions hereinbefore contained, the previous assent of the several States shall be signified by legislative acts; first, if any portion of the fund, invested as provided by the foregoing section, or any portion of the interest thereon, shall, by any action or contingency, be diminished or lost, it shall be replaced by the State to which it belongs; so that the capital of the fund shall remain forever undiminished; and the annual interest shall be regularly applied without diminution to the purposes mentioned in the fourth section of this act, except that a sum not exceeding ten per centum upon the amount received by any State under the provisions of this act may be expended for the purchase of land for sites or experimental farms, wherever authorized by the respective Legislatures of said States. Second, no portion of said fund nor the interest thereon shall be applied, directly or indirectly, under any pretense whatever, to the purchase, erection, preservation or repair of any building or buildings."

The General Assembly of Iowa, September 11, 1862, accepted the grant upon the conditions and under the restrictions contained in the act of Congress, and by so doing entered into contract with the General Government to erect and keep in repair all buildings necessary for the use of the College. By this action of the General Assembly the College was changed from an agricultural institution into a College of Agriculture and Mechanic Arts with the broad and liberal course of study outlined in the following paragraph.

In 1882 the General Assembly passed an act defining the course of study to be pursued as follows: Section 1. That Section 1621 of the Code is hereby repealed and the following is enacted in lieu thereof: "Section 1621. There shall be adopted and taught in the State Agricultural College, a broad, liberal and practical course of study, in which the leading branches of learning shall relate to agriculture and the mechanic arts, and which shall also embrace such other branches of learning as will most practically and liberally educate the agricultural and industrial classes in the several pursuits and professions of life, including military tactics. Section 2. That all acts, and parts of acts inconsistent with this act are hereby repealed."

August 30th the following act was approved by President Harrison: "Be it enacted by the Senate and House of Representatives of the United States in Congress assembled, that there shall be and hereby is, annually appropriated, out of any moneys in the treasury not otherwise appropriated, arising from the sales of public lands, to be paid, as hereinafter provided, to each State and Territory for the more complete endowment and maintenance of colleges for the benefit of agriculture and the mechanic arts now established, or which may hereafter be established, in accordance with an act of Congress approved July second, eighteen hundred and sixty-two, the sum of fifteen thousand dollars for the year ending June thirtieth, eighteen hundred and ninety, and an annual increase of the amount of such appropriation thereafter for ten years by an additional sum of one thousand dollars over the preceding year, and the annual amount to be paid thereafter to each State and Territory shall be twenty-five thousand dollars, to be applied only to instruction in agriculture, the mechanic arts, the English language and the various branches of mathematical, physical, natural and economic sciences, with special reference to their application in the industries of life, and to facilities for such instruction."

The income of the College from National and State sources is therefore expended in instruction, experimentation, and illustration in agriculture and in the mechanic arts, and in the underlying and related science and literature. All buildings are erected and all repairs thereon are made by the State of Iowa. The buildings are valued at about $1,550,000. The College was formally opened on the 17th day of March, 1869.

THE SCOPE.

The Iowa State College of Agriculture and Mechanic Arts seeks to aid the young men and women in the acquirement of a higher education. Instruction is given in the culture studies and sciences, together with such experimental work as to enable the students successfully to engage in a practical profession. Throughout the several courses, the study of the textbook is supplemented by lectures, discussions, library work, and the practical experimental work of the laboratory. The instruction is not merely theoretical, but also practical, the student verifying and putting into practice in the laboratory the instruction received.

The Iowa State College offers four five year courses and fourteen four year courses leading to the following degrees:

FIVE YEAR COURSES.

Five year course in Mechanical Engineering, leading to the degree of Bachelor of Science (Mechanical Engineering), B. S. (M. E.).

Five year course in Civil Engineering, leading to the degree of Bachelor of Science (Civil Engineering), B. S. (C. E.).

Five year course in Electrical Engineering, leading to the degree of Bachelor of Science (Electrical Engineering), B. S. (E. E.).

Five year course in Mining Engineering, leading to the degree of Bachelor of Science (Mining Engineering), B. S. (E. M.).

FOUR YEAR COURSES.

Course in Agronomy, leading to the degree of Bachelor of Science (Agronomy), B. S. (Agn.).

Course in Dairying, leading to the degree of Bachelor of Science (Dairying), B. S. (Dairying).

Course in Animal Husbandry, leading to the degree of Bachelor of Science (Animal Husbandry), B. S. (A. H.).

Course in Horticulture and Forestry, leading to the degree of Bachelor of Science (Horticulture and Forestry), B. S. (Hort. and For.).

Course in Agricultural Engineering, leading to the degree of Bachelor of Science (Agricultural Engineering), B. S. (A. E.).

Course in Science and Agriculture, leading to the degree of Bachelor of Science (Science and Agriculture), B. S. (Sci. and Agr.).

Course in Veterinary Medicine, leading to the degree of Doctor of Veterinary Medicine (D. V. M.).

Course in Mechanical Engineering, leading to the degree of Bachelor of Science (Mechanical Engineering), B. S. (M. E.).

Course in Civil Engineering, leading to the degree of Bachelor of Science (Civil Engineering), B. S. (C. E.).

Course in Electrical Engineering, leading to the degree of Bachelor of Science (Electrical Engineering), B. S. (E. E.).

Course in Mining Engineering, leading to the degree of Bachelor of Science (Mining Engineering), B. S. (E. M.).

Course in Ceramics, leading to the degree of Bachelor of Science (Ceramics), B. S. (Cer.).

Course in General Science, leading to the degree of Bachelor of Science (B. S.).

Course in Domestic Economy, leading to the degree of Bachelor of Science (Domestic Economy), B. S. (D. E.).

Two year courses are also offered in Mining Engineering and Clay Working, and one year courses in Poultry Husbandry and Dairying, for the completion of which, certificates will be given. That many, who are unable to take the full college course, may take advantage of the advancement being made in their chosen work, a two weeks' short course is now offered each year during the winter vacation in Stock and Grain Judging and Dairying. A School of Good Road Investigations is also held during each summer vacation. The interest in all of these short courses is becoming greater, the attendance is increasing, and the benefits to be derived from them are constantly increasing.

LOCATION.

The College occupies a delightful and healthful location upon high, rolling land in the west part of Ames, Story County. Situated at the junction of the north and south branch and the main double-track line of the Chicago & Northwestern Railroad, and connected with all the trunk lines of Iowa, Ames is easily accessible from all parts of the State. An electric railway connects Ames and the College with efficient service. The Fort Dodge, Des Moines and Southern Railway (electric), with stations on the campus, gives efficient service to the College, and excellent connections with the following trunk lines in Iowa: At Fort Dodge, with the Illinois Central and Chicago Great Western; at Kelley, with the Newton & Northwestern; at Huxley, with the Chicago, Milwaukee & St. Paul; at Des Moines, with the Chicago, Rock Island & Pacific, the Chicago Great Western, and the Chicago, Burlington & Quincy.

Ames is a most desirable town for wholesome college influences. Its people are thrifty, enterprising and cordial. The town has an excellent system of public schools, numerous churches, waterworks, and electric lights, and it also has a good city government. It is an inviting community for families who wish to educate their children and to enjoy a good environment at a reasonable expense. Ames and the College are on very cordial terms, and its citizens seek to promote the efforts of the students and the highest interests of the College.

THE COLLEGE GROUNDS.

Of the entire College domain of 1,200 acres, 125 acres are set apart for College grounds. These include the experimental plots, the young forestry plantations, the surroundings of the professors' dwellings, and the central campus with its beautiful winding walks and drives; its trees, shrubbery, and flower gardens; and its large and stately college buildings. The true principles of landscape gardening have been so faithfully observed in the gardening and in the location of buildings and drives as to make the entire campus a large and beautiful park.

BUILDINGS.

Thirty-three commodious buildings have been erected by the State for the exclusive use of the various departments of the College, besides the dwelling houses and the buildings for farm stock, machinery, and work. All of these buildings are heated by steam, lighted by electricity, and supplied with pure water.

GENERAL BUILDINGS.

Central Building: The new Central Building, which has been erected on the site of the Old Main, accommodates the Executive Offices, and the departments of English, Modern Languages, Economic Science, History, Mathematics, Public Speaking, Botany and General Bacteriology. The building is of buff Bedford stone, built in the Roman Renaissance style, which style has also been adopted for the Engineering and new Agricultural Halls. The building, completed and furnished, cost about $375,000.

Morrill Hall: Morrill Hall, one of the oldest of the College buildings, was named in honor of Hon. Justin S. Morrill, the originator of the "Land Grant" for Colleges of Agriculture and Mechanic Arts. It is of deep red brick with stone, brick, and terra cotta trimmings. In it are College Chapel, Library, Zoological Museum, lecture rooms, and laboratories.

Domestic Technology Building: This is a two story, with basement, fireproof building. The basement contains the lockers, reading room, and class rooms of the Domestic Economy Department. The first floor is devoted to offices and the laboratories for the Domestic Art work. The second floor contains the laboratories for the Domestic Science classes and the art room. It is expected that the building will be ready for occupancy by December 1, 1910.

Margaret Hall: Margaret Hall, the home of the young women of the College, occupies one of the most pleasing locations on the campus. It is built of brick, roofed with slate, provided with steam heat, electric lights, baths, and a large parlor. The hall accommodates about one hundred women, to whom the rooms are assigned in the order of their application. The privilege of rooming in Margaret Hall is reserved for regular students. In connection with the Hall there is a boarding club for the young ladies. Young women residents of Margaret Hall are required to board in this club. The young women are under the direction of an efficient matron.

The Campanile: A detached tower 110 feet in height is built of buff brick with terra cotta trimmings. This tower stands practically in the center of the campus. It contains a Seth Thomas tower clock with four dials, each seven feet in diameter. The tower also contains the Margaret Chimes presented to the Iowa State College by Dr. Edgar Williams Stanton in memory of his wife, Margaret McDonald-Stanton. This chime was manufactured by John Taylor & Company, Loughborough, England. It has ten bells, the combined weight of which is 15,000 pounds.

Chemical Hall: A three story brick building furnished with steam heat, water, gas, and laboratory equipment, accommodating 600 students in Chemistry.

Sanitary Hall: A two story brick building, containing offices, kitchen and dining room for the hospital patients, and rooms for the sick and convalescent.

Alumni Hall: This is a brick building, 87 by 48 feet, colonial in style, with three large porches. It has three stories and a basement; in the basement there are the cafe and swimming pool; on the first floor, there are reception rooms and reading rooms for the Young Men's and the Young Women's Christian Associations; on the second floor there are the assembly room and the Bible class rooms; and on the fourth floor there are three large parlors and fourteen sleeping rooms. This building was built by private subscriptions.

Music Hall: This is a two story brick building, fitted up with apparatus and instruments for practice and instruction.

Central Heating Plant: A central heating and power plant furnishes heat and power for all College purposes with very satisfactory results in comfort, economy, and cleanliness.

Custodian's Office: This is a small two story brick building about 40x36 feet. It is used for offices of the Custodian and the Military Department.

Book Store and Post-office: This is a small one story brick building about 44 x 55 feet, which contains the College book store and the branch government post-office known as Station "A."

Dwelling Houses: There are also on the campus eighteen comfortable dwelling houses occupied by professors' families, or by foremen and employees.

AGRICULTURAL BUILDINGS.

Hall of Agriculture: The Hall of Agriculture is 234x78 feet, and four stories in height. It is fireproof throughout, of the best modern construction, and arranged with suitable conveniences and facilities for thoroughly efficient high-grade work in agricultural instruction and investigation. This building, with its equipment complete, cost about $350,000.

The Annex of the Hall of Agriculture: This contains the assembly room, which is semi-circular in form, the base being ninety-six feet in diameter. The annex is fireproof throughout and of the best modern construction.

Agricultural Engineering Hall: This is a four story building, the lower stories of stone and the upper of brick. It contains recitation rooms of the divisions of Agriculture and of Veterinary Science, offices of the Experiment Station, and sewing rooms of the Domestic Economy Department.

Agricultural Engineering Annex: This is a four story, fireproof building, built of steel and pressed brick, costing, when equipped, about $70,000. It accommodates the workshops, tool rooms, blacksmith shop, carpenter shop, drafting room, reading room, rooms for the study and exhibition of various farm implements, offices and class rooms, bulletin rooms, and photographic department.

Dairy Building: This is a three story building built of pressed brick and trimmed with Bedford stone, containing factory, butter, and cheese rooms, bottling room, refrigerators, lunch room, offices, research laboratory, farm dairy room, students' testing laboratory, lecture room, dairy reading room, and bacteriological laboratory for research and investigation.

Horticultural Laboratory: This is a two story brick building connected with the greenhouse. The main floor, accommodating fifty students, is especially fitted for the study of fruits. The building is equipped with two refrigerators, one for experimental work in cold storage and the other for storing fruits for class purposes. The second floor contains the horticultural museum and facilities for photography.

Greenhouses: The present plant contains 10,000 square feet under glass. The houses are of cypress construction, supported by a steel structure. They are heated by steam, operated on the Paul system, with varying temperatures for the propagating house, the growing houses, and the seed testing houses. The houses also include four commodious work rooms used in potting, transplanting, and other necessary work.

Horse Barns and Stock Pavilion: The barn, built of brick, with a slate roof, is for horses, for the storage of grain, and for general farm purposes. The Stock Pavilion, also of brick, is circular in form, and is well heated and lighted, accommodating several hundred students at a time, and affording first-class advantages for stock judging and animal husbandry.

Station Barn: The Experiment Station barn is one of the best and most modern buildings of its kind to be found anywhere in the world. It is veneered with buff pressed brick, has a slate roof, paved brick floors, and is in every respect entirely fireproof. The building is devoted to the housing of beef and dairy cattle and horses and to the storage of vehicles and machinery. It is also used as a storage and grinding room for feed, and as seed rooms for the drying of corn and the storage of grain and feed stuffs used in experimental work.

Judging Pavilion: In connection with the experimental barn, there is a two story octagonal judging pavilion. It is built of buff pressed brick with a slate roof. The lower story is used for stock judging, and the upper for grain judging. This building, thoroughly equipped in every way, is conceded to be the best building of its kind on the continent.

Other Buildings: Stables, barns, and seed houses sufficient for the requirements of the farm, are conveniently grouped near the College campus.

VETERINARY BUILDINGS.

The New Hall of Veterinary Medicine: The New Hall of Veterinary Medicine, the erection of which will begin this year, is to be 144x176 feet, three stories in height. The large interior court is to be used for clinical purposes. New and modern equipment will be installed throughout.

Veterinary Hospital: This is a three story brick building, fitted with well lighted single and box stalls, operating rooms, office and pharmacy, resident surgeon's room, dissecting room, etc. It is well furnished with all the surgical instruments of modern construction, operating table, and other important conveniences for clinical as well as for general hospital work.

ENGINEERING BUILDINGS.

Engineering Hall: The Engineering Departments occupy the new Engineering Hall. This is a fireproof building in which all the engineering departments have offices, recitation and lecture rooms, laboratories and engineering museum. It is of Bedford stone, has plate glass windows, and modern conveniences and furnishings throughout. This building, costing $220,000, is the best engineering building west of the Mississippi river.

Engineering Annex: This is a two story fireproof building, 50 x 208 feet, completed in the fall of 1909. The total cost is $41,000. The first story is devoted to the use of the Electrical Engineering Department, the Mining Engineering Department and the Surveying Department. In it are located the dynamo engineering laboratory, assaying and clay working rooms for the Mining Engineering Department, and instrument room and class room for the Surveying Department. The second story contains additional rooms for the Mining Engineering Department, the remainder being given up to drafting rooms and class rooms for the Electrical, Civil, and Mechanical Engineering Departments. A third story is being held in reserve, to provide additional accommodations as the constant growth of the department demands.

The Ceramics Building: The last Legislature provided an appropriation of $15,000 for the construction of a new Ceramics building. This was completed in the fall of 1909. It is a three story, fireproof building, 70x50 feet, containing clay working rooms, kiln rooms, and other adequate accommodations for the Ceramics work. The chemical part of the Engineering Experiment Station work is done in this building.

Structural and Hydraulic Laboratory: This is a three-story stone and brick building, which has been entirely remodeled and rebuilt into a modern laboratory building, fireproof except for the roof. The Hydraulic laboratory occupies a basement wing lined with enameled brick, and also the floor above it. There are two large structural laboratory rooms, one large cement laboratory room, four computing and research rooms, five instrument rooms, and offices. The Engineering Experiment Station and the Structural Testing Laboratories are also located in this building.

Power Station: This is a one story brick building, 36x120, devoted to the lighting and pumping plants of the College, and to the heating plant for the engineering buildings. All of the equipment is used for purposes of instruction, as far as this does not interfere with its other uses. In this way quite extensive equipment for steam and gas engine laboratory work is made available. The building contains an engine and dynamo room, a boiler room, and a pump room.

Foundry: This is a one story brick building, 38x78 feet, containing the equipment for instruction in foundry practice. The roof trusses are of steel and are calculated to carry traveling cranes for transferring heavy castings and forgings.

Forge Shop: This is a one story brick building, 38x78 feet, with a store room at one side in an addition. The building was constructed in 1906. It contains equipment for instruction in forge shop practice. The roof trusses are of steel and the roof is of slate.

Pattern Shop: This is a one story brick building, 38x120 feet, devoted to the work of instruction in bench work, wood turning, and pattern work. A fireproof room is provided for the storage of patterns.

Locomotive Laboratory: For the temporary protection of the locomotives donated to the Department of Mechanical Engineering by the Chicago & Northwestern railway and by the estate of S. H. Mallory, a corrugated iron structure has been provided.

Machine Shop: This is an entirely new building, 150x45 feet, just erected. It is practically two stories high, and, besides a large machine shop, surrounded by a gallery, it contains laboratory, locker room, office, class room, and tool room. This building is one of the best college engineering shops in the country.

ACCREDITED SCHOOLS.

High schools and academies may be placed on the accredited list, by action of the Faculty, upon recommendation of the Committee on Entrance Requirements and Secondary Schools. The complete list of the fully accredited schools of Iowa is not published in this catalogue, but will be found in the Iowa Educational Directory. We desire the fullest co-operation and consultation with the High Schools of the state. All questions with regard to the inspection or relation of any school to the College should be addressed to Prof. Forest C. Ensign, Inspector of Secondary Schools for the Board of Education.

Admission to the College

All communications with regard to the admission of any student to the College should be addressed to the Registrar. The Registrar will determine the value of all credentials and will notify the applicant of their acceptance. He will also assign the applicant for admission to his position in the course desired. This assignment will be conditioned upon the student's doing creditable work.

Applicants for admission to the freshman class should be at least sixteen years of age.

A student may enter the College at the beginning of either semester. The regular classes begin with the opening in September and the student is urged to commence at that time. The freshman subjects are, however, taught in both semesters. The Freshman work will be of such grade that a graduate of an accredited school can reasonably be expected to be prepared to carry it creditably. The responsibility of maintaining himself in the Freshman class rests, however, upon the student, and it is urged upon all that they review thoroughly, just before entering, at high school or elsewhere, their Algebra and English Grammar. Students desiring admission should examine **the requirements for admission and the methods of obtaining the thirty credits for admission.**

REQUIREMENTS FOR ADMISSION TO THE SEVERAL DIVISIONS OF THE COLLEGE.

The requirements for admission are stated in terms of credits. The term credit means the equivalent in a given subject of five from forty to fifty-minute recitations per week for a term of eighteen weeks, adequate time being given to the preparation of each lesson. Students desiring admission to the Freshman year must present thirty credits. Of these, certain are required and the balance may be elective.

CREDITS REQUIRED FOR ADMISSION.

	Division of Agriculture. Credits.	Division of Veterinary. Credits.	Division of Engineering. Credits.	Division of Science. Credits.
Algebra	3	3	3	3
Geometry, Plane	2	2	2	2
Geometry, Solid			1	
English	6	6	6	6
History	2	2	2	2
*Language— German, French, Spanish, or Latin,	4	4	4	4
Science	1	1		1
Electives— Twelve credits from the following list of electives	12	12	12	12
	—	—	—	—
Total credits for admission	30	30	30	30

*Students may be admitted without Foreign Language under the following conditions:

1. The student must offer all of the required credits except the four in Foreign Language, together with sufficient elective credits to make a total of thirty.
2. The language requirements must be made up before graduation. This will ordinarily require, if taken in College, extra work to the extent of five hours a week for one year. Such extra work will not be credited as part of the credit hours required for graduation in the several courses. Opportunity for making up deficiencies in language will be offered by the College.

In the divisions of Science and Engineering, no foreign Language course of less than two credits will be accepted for required entrance credits in language. Students offering Foreign Language for admission credits are urged to offer four credits in one language, preferably a Modern Language.

List of Elective Credits.

Subject.	Credits.	Subject.	Credits.
Agriculture	1	English	1 or 2
Astronomy	1	Geology	1 or 2
Bookkeeping	1 or 2	German	2 or 4
Botany	1 or 2	Greek	2 or 4
Business Arithmetic	1 or 2	History	2 or 4
Chemistry	1 or 2	Latin	2 or 4
Civics	1 or 2	Manual Training	1, 2, or 3
Commercial Geography	1	Mathematics	1 or 2
Drawing	1 or 2	Mechanical Drawing	1, 2, or 3

Subject.	Credits	Subject.	Credits.
Mental Arithmetic	1	Political Economy	1 or 2
Optional	2	Spanish	2 or 4
Physics	2	Stenography	1 or 2
Physical Geography	1 or 2	Zoology	1 or 2
Physiology	1 or 2		

Limitations: Not more than four elective credits will be accepted in Foreign Language or in any other subject. No Foreign Language course of less than two credits will be accepted from students presenting only one Foreign Language.

Optional Subjects: An optional subject is any subject of the student's High School course not specified in the list of elective subjects.

METHODS FOR OBTAINING THE THIRTY CREDITS FOR ADMISSION.

There are four methods of obtaining the necessary credits for admission to the Freshman class:

A. Admission by transfer from other Colleges and Universities.
B. Admission by certificate from a fully accredited High School.
C. Admission by Examination.

A. Admission by Transfer From Other Colleges and Universities.

A student who has entered another College or University of recognized standing and asks admission to this College, must present a certificate of honorable dismissal from the institution from which he comes. He must also present an official statement of the subjects upon which he was admitted to such institution. Provided it appears that the institution has Entrance Requirements equal with this College and that the certificate shows clearly that the student has been required to meet fully the thirty credits required by this College, he will then be admitted. For the acceptance of standings from other Colleges or Universities to apply as college work in this College, see Acceptance of Advanced Standings.

B. Admission by Certificate From the Fully Accredited High Schools.

Graduates of the fully accredited High Schools of Iowa who meet fully the requirements for admission to the Freshman class, will, upon presentation of the proper Uniform Certificate, be admitted to the College without examination.

Graduates of schools fully accredited by the Colleges of other states which have as high a standard of entrance requirements as this institution, will also be admitted as Freshman upon presentation of certificate of graduation, accompanied by Uniform Admission Certificate.

Superintendents and Principals are urged to send to the Registrar immediately upon the close of the school year, the Uniform Admission Certificate of each graduate intending to enter the College at the beginning of the ensuing College year. If, on inspection, the certificate is found satisfactory, the applicant will be forwarded a certificate entitling him to admission without examination. Uniform Admission Certificates may be obtained by teachers and students upon application. Candidates for admission may apply to the Registrar for the Uniform blank. The Certificate must show the grade of work done and textbooks used in the subjects required for entrance, with a definite statement of the year of the High School in which the subject was taken, the number of recitations per week, and the number of weeks the subject was pursued during the High School Course.

Diplomas of graduation will not be accepted for entrance unless accompanied by a Uniform Certificate as stated above.

All Uniform Certificates should be filed with the Registrar not later than the second Monday in August or the first Monday in January.

C. Admission by Examination.

Students desiring to enter by examination will be given such examinations in any subject required for entrance, upon presentation of satisfactory evidence of their having devoted sufficient time to the preparation of such subjects.

Students desiring to enter by examination will be expected to pass examinations in the following required and elective subjects;

Required Subjects: The subject matter to be covered is according to the material found under the general statement concerning entrance credits, page 35, which gives a synopsis of the amount and kind of work required for entrance.

Algebra.
Plane Geometry.
English,
    Composition and Rhetoric.
    Literature, American and English.
    Review Grammar.
Languages.

Two years' work in any one of the following or one year's work in two different languages:

    Latin.
    German.
    French.
    Spanish.

History.
Solid Geometry or Science.

For the Agricultural, Veterinary, or Science Division, one science, Botany preferred. For the Engineering Division, Solid Geometry.

Elective Subjects: Divided into two classes; those which require the equivalent of one year's work in High School, five hours per week, here listed as major subjects; and those which require one semester's work, five hours per week, here listed as minor subjects.

The candidate will be required to pass examinations in six major subjects; or, for every major subject in which he does not take an examination, he will be required to take examinations in two minor subjects.

Major Subjects.

Physics.
Chemistry.
Zoology.
Physiology.
Physiography.
Economic Science.

Minor Subjects.

Civics.
Drawing.
Agriculture.
Review Arithmetic.
Commercial Geography.
Bookkeeping.
Geology.
Manual Training.
Optional.

Entrance Examination Periods.

Examinations for entrance to College will be conducted at the opening of each semester on the Tuesday and Wednesday preceding classification.

Tuesday.

8 to 10 A. M.—Public Speaking. Room 308, Central Building.
10 to 12 A. M.—English. Rooms 1 and 3, Central Building.
1 to 3 P. M.—Language. Room 119, Central Building.
3 to 5 P. M.—Botany. Room 312, Central Building.

Wednesday.

8 to 10 A. M.—Mathematics. Room 221, Central Building.
10 to 12 A. M.—History. Room 208, Central Building.
1 to 3 P. M.—Civics. Room 102, Central Building.
3 to 5 P. M.—Language. Room 119, Central Building.

The Registrar will arrange for the other examinations required by the candidates for admission.

SPECIAL STUDENTS.

Students taking special work in any of the College courses must be at least twenty years of age, must give good and satisfactory reasons for desiring such classification, and must furnish satisfactory evidence that they are thoroughly prepared to pursue the work chosen. Permission to take such special course and the subjects included therein depends upon the approval of the President of the College and the Dean or Head of the Department in which the student seeks enrollment.

(1) Permission to take a special course will not be granted to students until they have completed the Freshman year of some one of the courses offered, and then only for a period not to exceed two years except on the recommendation of the Faculty of the division in which the student is enrolled and on approval of the President of the College.

(2) All special students shall pay additional fees for special work of ten dollars for each semester.

Special and Short Course students are subject to the same rules governing conditions on back work that apply to all other students. Students wishing to change from a regular to a special or short course, either in the same or another department, will be required to remove all conditions on back work. Special students, as well as regular students, are subject to the conditions given under Requirements for Admission.

It is the theory of special classification that students should be particularly strong and well prepared to do thorough work in the studies they elect. A high standard of scholarship will, therefore, be required of all who are thus classified.

SHORT COURSE STUDENTS.

Worthy students of good standing, over twenty years of age, not prepared to meet the entrance requirements of the Freshman year, may be admitted as students of a short course not to exceed two years without examination, provided they give evidence of satisfactory preparation to carry such work successfully. Students will be required, however, to present a certificate covering their preliminary education. Short Course students who have not had previous work of collegiate grade will be required to take the first year of their work from Junior College studies.* During the second year they may be admitted to the Senior College studies in accordance with the rules governing admission to each study or course.**

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*Special Interpretation for Agricultural Students.—An exception to this rule will be made in case of Animal Husbandry 11 and 12. These courses may be taken the first year in lieu of Animal Husbandry 2 and 3, which cannot be taken until the work in Animal Husbandry 1 and 2 has been completed.

**For conditions of admission to any course, see the description of the course of study.

General Statement Concerning Entrance Credits.

Students and others desirous of learning something of the amount and kind of work required for entrance to Freshman classes will find suggestive outlines below for some of the most important subjects.

MATHEMATICS.

Following the policy of other institutions, this College accepts three credits in algebra, two in plane geometry, and, in the Engineering Courses, one of solid geometry, as meeting its entrance requirements in mathematics. Experience shows us, however, that those students are best prepared who have taken this work in the preparatory school in order as follows:

(a) Algebra, two credits:

Addition, subtraction, multiplication, division, factoring, highest common factor, lowest common multiple, fractions, simple equations (with one, two and several unknown quantities), followed by problems, theory of exponents, involution, evolution, radicals, inequalities, quadratics (with one or two unknown quantities), and problems involving quadratics.

(b) Plane Geometry, two credits:

The work on this part of the subject is such as is given in any standard text in geometry, including a large number of exercises.

(c) Solid Geometry, one credit:

This should cover the same ground, (including originals), as that included in any good text.

(d) Review Algebra, one credit:

While this subject does not include any topic not named under elementary algebra, a much fuller treatment of these subjects is expected in this work. Principles as well as processes should be learned; theorems and rules should be rigorously demonstrated; the exercises and problems should be more difficult; and students should be drilled in short methods and rapid and accurate work.

This review in algebra should be given in the last year of the high school, when the student has the maturity gained by age and the broader reasoning powers acquired from geometrical training. Such a review immediately before entering college will give the student a broader and more comprehensive knowledge, will make clear to him many things which he did not understand when he first went over them, and will equip him with better and more rapid methods of work. Experience has proved the statement true that, "It is not sufficient that a student *should once have known* his preparatory mathematics; he must know them *at the time when he begins his work here.*"

(e) Additional credits:

Certain schools in the state use three semesters for the work of course (a) and give the review in addition in the senior year. Since this gives the student a much more thorough foundation and is particularly desirable, especially in the engineering courses, an additional elective credit is given when such work is taken.

ENGLISH.

The six credits required in English include the following subjects, and should provide the training indicated below:

1. Composition and Rhetoric, two credits:

The constant aim in this study should be to acquire the habit of clear and correct expression. To secure this result the fundamental principles of rhetoric should be taught not as an end, but as a means to an end—the development of skill; not as definitions to be memorized, but as rules to be applied in actual composition. Accordingly the course should require constant practice in writing, followed by careful revision and correction of mistakes. The topics for themes may be drawn in part from other studies, such as literature and history, but in the main they should rest upon experience and observation, in order that the student may be trained to clear, correct, and effective self-expression. In all his writing he should cultivate habits of correct spelling, sentence-structure, punctuation, and paragraphing. Should his Freshman themes prove defective in these respects, the college reserves the right to require him to make up his deficiencies.

2. English and American Literature, three credits:

Reading of Classics. The following books are recommended by the Joint Conference on Uniform Entrance Requirements in English, and the list has been accepted by practically all the colleges in the United States.

1908-1911.

(a) **For Reading**, ten books selected from the following list:
Group I. (Two to be selected.) Shakespeare's *As You Like It*, *Henry V.*, *Julius Caesar*, *The Merchant of Venice*, *Twelfth Night*.

Group II. (One to be selected.) Bacon's *Essays*, Bunyan's *The Pilgrim's Progress*, Part 1; *The Sir Roger de Coverly Papers* in the Spectator; Franklin's *Autobiography*.

Group III. (One to be selected.) Chaucer's *Prologue;* Spenser's *Faerie Queene*, (selections); Pope's *The Rape of the Lock;* Goldsmith's

The Deserted Village; Palgrave's *Golden Treasury* (First series) Books II and III, with especial attention to Dryden, Collins, Gray, Cowper, and Burns.

Group IV. (Two to be selected.) Goldsmith's *The Vicar of Wakefield;* Scott's *Ivanhoe;* Scott's *Quentin Durward;* Hawthorne's *The House of Seven Gables;* Thackeray's *Henry Esmond;* Mrs. Gaskell's *Cranford;* Dickens' *A Tale of Two Cities;* George Eliot's *Silas Marner;* Blackmore's *Lorna Doone.*

Group V. (Two to be selected.) Irving's *Sketch Book;* Lamb's *Essays of Elia;* De Quincey's *Joan of Arc* and *The English Mail Coach;* Carlyle's *Heroes and Hero Worship;* Emerson's *Essays* (selected); Ruskin's *Sesame and Lilies.*

Group VI. (Two to be selected.) Coleridge's *The Ancient Mariner;* Scott's *The Lady of the Lake;* Byron's *Mazeppa* and *The Prisoner of Chillon;* Palgrave's *Golden Treasury* (First series) Book IV., with especial attention to Wordsworth, Keats, and Shelley; Macaulay's *Lays of Ancient Rome;* Poe's *Poems;* Lowell's *The Vision of Sir Launfal;* Arnold's *Sohrab and Rustum;* Longfellow's *The Courtship of Miles Standish;* Tennyson's *Gareth and Lynette, Lancelot and Elaine,* and *The Passing of Arthur;* Browning's *Cavalier Tunes, The Lost Leader, How They Brought the Good News from Ghent to Aix, Evelyn Hope, Home Thoughts from Abroad, Home Thoughts from the Sea, Incident of the French Camp, The Boy and the Angel, One Word More, Hervé Riel, Pheidippides.*

(b) **For Study and Practice:** Shakespeare's Macbeth; Milton's *Lycidas, Comus, L'Allegro,* and *Il Penseroso;* Burke's *Speech on Conciliation with America,* or *Washington's Farewell Address* and Webster's *First Bunker Hill Oration;* Macaulay's *Life of Johnson,* or Carlyle's *Essay on Burns.*

In the study of the books prescribed above the constant aim should be to develop the student's power of appreciation. He should be trained to observe for himself, to analyze for himself, to reach judgments of his own. One excellent method is to give with each assignment specific questions directing attention to certain qualities of thought or plan or style. In this way the student may be trained to observe the fundamental qualities and principles of literary expression. The selecting of appropriate epithets and figures of speech, of beautiful, suggestive, or forcible phrases, of qualities that make style now easy or familiar, now ornate, dignified, or forcible, will develop a sense of literary values, and cultivate the power of literary appreciation. Moreover, by such study the student will insensibly strengthen and enrich his power of self-expression. Having been trained to see and to appreciate clearness, force, and beauty, he will strive to develop these qualities in his own writing, and literature will acquire an added interest through a sense of the power it may confer. In other words the student should come to feel the utility of literature as well as its beauty. The teacher who appreciates that development is the end to be sought will guard against giving ready-made judgments which may injure by forestalling investigation. Properly taught, literature calls for observation, analysis, comparison, as truly and as constantly as does botany. The teacher's function is largely to direct this observation. Manuals of literature, however excellent, should be treated as subsidiary. Biographical details may be helpful in stimulating interest, the conditions of the time may supply the setting, but the thing to be *studied* is the book itself.

3. Grammar, one credit.

In the last year of the high school course there should be a thorough review of grammar, extending through one semester. Prior to this time in the course the student is not mature enough to master the more difficult relations of the sentence, or to appreciate how necessary a clear knowledge of sentence structure is to real progress in composition. If the student does not understand the structure of the sentence, he cannot reasonably be expected to frame sentences that are correct in structure or to learn to construct better sentences; thus his ignorance of grammatical relations prevents real progress in composition.

The percentage of failures in the first course in college composition would be materially reduced if grammar were more thoroughly reviewed in the last year of the high school course. From this review the student should be helped in the following ways:

a. He should be trained to analyze good modern prose, sentence by sentence, from such authors as Addison, Macaulay, Hawthorne, and Stevenson. He should be trained to observe clearness, emphasis, unity, climax, variety, and other qualities in sentence structure, and to note the effect of different types of sentence—short, long, balanced, loose, and periodic.

b. He should also be trained to construct sentences of all types. One very helpful method is for the teacher to give out in analyzed form well-constructed sentences of the various types, and require the student to arrange these elements in the best order for clearness, emphasis, balance, climax, etc. Most students find this constructive work more interesting than the analytical, and also more helpful.

c. He should also be trained to analyze the sentences of his own essays, to note sameness or variety in sentence length and form, also clearness, emphasis, balance, and other qualities essential to effective expression. It is not assumed that his high school course in English will make him a master sentence-builder, but it should give him sufficient knowledge and practice to make his every sentence clear and correct, and it should start him on the road to mastery of sentence construction.

4. Elective Credits in English.

Students who present the required credits set forth above, may also receive two elective credits for additional work. Such credits will be granted for more extended study of English or American Classics, or for the study of a good History of Literature, supplemented by study of some of the minor authors not previously studied, or by more minute or more extended study of the major authors.

HISTORY.

It is recommended that emphasis be put on history in the High Schools along the line suggested by the Report on History in Schools by the Committee of Seven of the American Historical Association, and that not less than two years be given to the subject. The following would be a suggestive course: One year in Greek and Roman History; one semester in English History, or Modern History with special emphasis on English History; one semester in American History. If a three years course be given, a year should be devoted to each of the above. If a four-year course be given, the following is suggested: One year each to the following subjects: Greek and Roman History, to 800 A. D., Mediaeval and Modern from 800 A. D., English History, American History.

In all the above there should be the use of the best modern texts. There should also be outside reading with notes, and some instruction in historical geography.

The American History given in the Academic year at the State College is what is usually given in the fourth year of the High School after the pupil has had European or English History in the preceding years. It is recommended that students contemplating entering this College take Advanced American History in the fourth year of the High School. The sample questions will indicate the general scope of the work.

MODERN LANGUAGES.

The work in a Modern Language should be a careful preparation which shall enable the student to continue the same work in college with ease. Whether the amount of reading covered is relatively small or great, the training should consist of a thorough knowledge of grammar. Proficiency is of the greatest importance.

Suitable texts may be found in the Report of the Committee of Twelve of the Modern Language Association of America. A representative amount of work in preparation is as follows:

GERMAN.

First Year: Rudiments of grammar, reading of from 75 to 100 pages of graduated texts with careful drill in pronunciation from a trained teacher, constant practice in translating simple English sentences into German, and the memorizing, with frequent repetition, of easy colloquial sentences and of short poems.

Second Year: Reading of from 150 to 200 pages of easy stories and plays, thorough drill in grammar continued, and constant practice in translating English into German.

FRENCH.

First Year: A thorough knowledge of grammar, reading of from 150 to 200 pages of easy texts, constant practice in translating simple English into French, and careful drill in pronunciation.

Second Year: Reading of from 250 to 400 pages of texts; thorough review of grammar, together with constant practice in translating English into French; and conversation with continued drill in pronunciation.

BOTANY.

The student should master the principles of the general morphology of flowering plants and the terms commonly used in descriptive botany, as well as the determination of our common flowering plants. The high school should offer laboratory work along with Leavitt's Lessons, or Bergen & Davis' "Principles of Botany," or Coulter's "Text-Book of Botany," or any other work covering the same general ground.

SUGGESTIVE LIST OF EXAMINATION QUESTIONS.

For Entrance by Examination Into the Freshman Year.

ALGEBRA.

1. From $5xy-(m-n)\ (k+1)-(a+b)\ \ (d+c)$ subtract $(d+c)$ $a-b)+5\ (k+1)-acy-mny$.

2. Remove the parentheses and simplify.

$$7x^2\left\{\frac{a+b}{c-d}-y-4-(n-m)\right\}-\left\{\frac{2(y+4)}{3}-71x^2-\frac{a+b}{c-d}-\overline{m-8+n}\right\}+8$$

State the rule by which parentheses preceded by the plus or minus sign are removed.

3. Divide $-45a^{1-x}b^{-2}c^x(m+n)^5+ab^xc^{1+x}\ (m^2+2mn+n^2)^3$ by $3a^6b^2c^x(m+n)^3$.

4. Write the product of $(3x-2)\ (3x+5)$, of $(2x+2)\ (2x+2)$, and also of $(3y+1)\ (3y-1)$ and give the special rules of multiplication used.

5. Resolve $a^{12}-a^8b^4-a^4b^8+b^{12}$ into its prime factors.

6. Find the lowest common multiple of

$$2x^4+3x^3+3x-2 \text{ and } 3x^4+5x^3+x^2+5x-2.$$

7. Simplify

$$\frac{a^2-b}{(a-b)\ (a-l)}+\frac{b^2+a}{(b+l)\ (b-a)}+\frac{1+ab}{(l-a)\ (l+b)}$$

What is the effect on a fraction of changing:

(a) Any two of the three following signs: sign of numerator, sign of denominator, or apparent sign of the fraction.

(b) The signs of an odd number of factors in the numerator.

(c) The signs of an even number of factors in the numerator.

8. Solve the following equation:

$$\frac{x-\frac{3(x-5)}{4}}{8}-\frac{x-3}{4}=x+1-\frac{8x-\frac{2(x+16)}{17}}{6}$$

9. A man rowing at a certain rate makes the round trip from A up stream to B, 24 miles distant, and return, in 5 hours. Having six hours at his disposal, he starts to make the trip, but when 16 miles from A, the boat springs a leak which causes him to land. In so doing he loses 40 minutes, but by walking at three-fourths the speed the boat would have carried him, he is able to spend an hour in B, and reach home in the required time by a train moving at twice the speed with which the boat would have moved down stream. What is the rate in miles per hour of the man rowing in still water, and what is the rate of the current?

10. Find the values of a and b in the following:

$$\frac{3}{2a}-\frac{4b}{b-2a+3}=2\tfrac{1}{2}$$

$$\frac{1}{a}+\frac{1}{b-2a+3}=-\tfrac{1}{6}$$

11. Find the value of $(-5a-yb^{k+1}c^3)-$ freeing the result of negative exponents.

12. Find the cube root of:

$8a^{\frac{3}{2}}-12a^{\frac{1}{2}}+42a^{-\frac{1}{2}}-\frac{1}{2}-37a^{-\frac{3}{2}}+63a^{-\frac{5}{2}}--27a^{-\frac{7}{2}}+27a^{-\frac{9}{2}}$.

13. Find the sum of $\sqrt[3]{54x^{a-3}y^6}$, $\sqrt[3]{16x^{a+6}y^3}$ and $\sqrt[3]{2x^{4a+9}}$.

14. Multiply $\sqrt[2n]{x^3}$ by $\sqrt[n]{x}$ by $\sqrt[3n]{x^2}$

15. Find the cubic root of $\frac{3}{5}\sqrt{\frac{3}{5}}$

16. Multiply $\sqrt{2}-3\sqrt{-5}$ by $\sqrt{5}+\sqrt{-3}$

17. Find the square root of the binominal surd $67+7\sqrt{72}$

18. Solve $\sqrt{x^2-6x}-5\sqrt[4]{x^2-6x}+6=0$

19. Solve $9x^2-5xy=21$ and $xy-y^2=-4$, solving for x and y.

20. Two trains starting at the same time and going in opposite directions between M and N, upon meeting, have differed in the distance covered by 20 miles. It is found that the train from M will reach N in one and one-half hours from the time of meeting and the train

from N will reach M in 40 minutes. How far apart are M and N and what is the rate of each train?

ENGLISH.

The examinations in English will include questions in grammar and elementary rhetoric and also one or more essays, to test the student's readiness and accuracy of expression. The following list of questions indicates the general nature of the examination:

I. In the following sentence, (a) state the exact grammatical relationship of each phrase and clause; (b) parse the words in black; (c) account of punctuation. "**What** if their palaces were grand, and their villas **beautiful** and **their** dresses magnificent, and their furniture costly, **if** their lives **were spent** in ignoble and enervating pleasures, **as** is **generally** admitted?"

II. In the following sentences name the part of speech and state the office of the words in black:

(a) I believe **him to be unprejudiced.**

(b) **Alice,** did you go **boating yesterday?**

(c) It cost **me** a **struggle** to **give** up the trip.

(d) They let **him stay.**

(e) Ask **yourself** seriously **whether** you are **fit to read such** revelations **as are to follow.**

III. Discuss **fully** and **carefully** four of the following topics:

(a) The topic sentence and its development.

(b) The respective advantages of the long sentence, the periodic sentence, the balanced sentence.

(c) Unity in the paragraph.

(d) Coherence in the composition.

(e) Emphasis in the sentence.

IV. Write an essay of from 250 to 350 words on one of the following topics:

(a) A Reminiscence of My Childhood.

(b) Why I like ————. (a book, an eminent man, a place.)

(c) Describe a view from ————.

(d) All Students Should be Required to Take Athletics.

NOTE.—These essays are considered an important part of the examination. They will be graded mainly in diction, sentence structure and connection, and paragraphing. Good penmanship, neatness of manuscript, and correct spelling and punctuation are also important.

V. The examination in Literature will consist of two parts: first, over some of the books prescribed "For Reading;" and second, over some of those prescribed "For Study and Practice." (See pp. 40 and 41.)

The first part of this examination is designed as a test of the student's appreciation of the book as a whole, or of some prominent incident, character, or quality; also as a test of his ability to express himself in accordance with the fundamental principles of discourse. Effective training for such an examination would be provided by writing concise paragraphs or well arranged essays on topics such as are suggested above.

The second part of the examination will call for evidence of more thorough and systematic study. It may call for concise answers concerning allusions, figures of speech, qualities of style, and the interpretation of certain passages. It may also call for analysis or comparison or grouping of characters; also for plot, development in the work as a whole, or in some prominent part.

In both parts, knowledge of details, of minutiae of any sort, will be considered much less important than the ability to express thoughts, clearly, correctly, and in good order. In like manner the mere memory of details, of literary history, or of opinions of critics, signifies much less than a genuine, independent appreciation of literature, the power to enter into the merit of a book.

The following questions on *The Tale of Two Cities* suggests the sort of topics that may be anticipated on the books prescribed "For Reading:"

1. Are the titles of the "books" into which the story is divided, good ones? (1. Recalled to Life; 2. The Golden Thread; 3. The Track of a Storm.) Tell why. Discuss one title fully, the others briefly.

2. Write a character sketch of one of the chief characters. (Not long, necessarily, but complete.)

3. Write a careful description of what you consider the greatest scene.

The following questions on *Macbeth* suggest what may be anticipated on the books prescribed "For Study and Practice."

1. Explain the structure of the play, giving the initial incident, the climax, and the catastrophe.

2. Explain the function of the first scene.

3. State briefly by whom and under what circumstances the following lines were spoken:

a. "Had I but died an hour before this chance,
I had lived a blessed time."

b. "All the perfumes of Arabia will not sweeten this little hand."

c. "Thy bones are marrowless, thy blood is cold;
Thou hast no speculation in those eyes
Which thou dost glare with."

4. What makes the sleep-walking scene so effective?

5. Explain the meaning of this passage, carefully, step by step:

"If it were done when 'tis done, then 'twere well
It were done quickly; if the assassination
Could trammel up the consequence, and catch

With his surcease success; that but this blow
Might be the be-all and the end-all here,
But here, upon this shoal and bank of time,
We'd jump the life to come."

6. Compare Macbeth and Banquo.

HISTORY.

EUROPEAN HISTORY.

1. Discuss (a) the significance of the Nile in the history of Egypt, and (b) the arts and industries of ancient Egypt. (c) Outline the work of a famous Egyptian king.

2. Give the date, important facts, and results of the Persian invasion of Greece in the reign of Darius.

3. The Athenian Empire: (a) trace its origin; (b) when was it at its height? (c) state the effect of the Peloponnesian war upon it.

4. Discuss the influence of the geographical features of Italy upon Roman history. Name the races of people in Italy at the dawn of the Italian history.

5. Outline the chief features of the Roman constitution in the reign of Augustus.

6. Feudalism: (a) its origin; (b) classes in feudal society; (c) feudal rights and obligations; (d) value of feudalism.

7. Give date, causes, and results of the Crusades.

8. Discuss the rise and growth of the Italian city republics.

9. Magna Charta: (a) circumstances under which it was secured; (b) chief provisions.

10. Reformation in Germany: (a) leading men; (b) principal steps in the movement.

11. Discuss fully the causes of the French revolution.

12. State something of importance concerning each of the following: Cardinal Wolsey, William the Silent, Cardinal Richelieu, Gustavus Adolphus, Charles Martel, Peter the Great, Oliver Cromwell, Lord Nelson, Bismarck.

AMERICAN HISTORY.

1. Sketch a map of the United States, indicating (a) the boundaries at the close of the Revolutionary War, and (b) each tract of land secured by treaty or purchase since the Revolution.

2. When and by whom was each of the following colonies first settled? New York, Virginia, Georgia, and Pennsylvania.

3. Tell something of importance concerning each of the following:

Patrick Henry, William Loyd Garrison, Robert Fulton, William Penn, Robert Morris.

4. The United States Constitution: (a) By whom framed? (b) Why was such a new constitution needed? (c) When adopted? (d) What were some of the most striking differences between it and the articles of Confederation? (e) When and in what respects has the Constitution been amended?

5. Enumerate the most important political parties which have arisen in the United States. State circumstances of the rise of each.

6. What were the most important facts concerning Jefferson's administration?

7. War of 1812: (a) Causes; (b) Important leaders; (c) Results and significance.

8. Discuss the relation of Henry Clay to the Slavery Struggle.

9. The Southern Confederacy: (a) When established? (b) Its president? (c) Why established? (d) How long it lasted? (e) What states it included?

10. Write an essay of not more than 300 words on the American Indian.

FEES AND EXPENSES.

The entire expenses of a student need not exceed $300.00 per College year.

Tuition.—No charge for tuition is made to the students from the state of Iowa. To the non-residents, a tuition fee of $50.00 per year is charged.

Incidental Fee.—The regular incidental fee for the semester is $10.00, but all students who classify during the classification period, Thursday, Friday, and Saturday, before College work begins, will be charged only $8.00 per semester.

Laboratory Fees.—Laboratory fees at the actual cost of breakage and usage are charged to the students, the Treasurer's receipt for such fee being required before the students are admitted to laboratories. For the amount of the fee in any course the student should refer to the description of courses, under the department in which the course is taught (see index).

Special Student's Fee.—All special students shall pay an additional fee for special work of ten dollars per semester (see rule under Special Students).

Board and Room.—About one hundred young women can secure rooms in Margaret Hall. The privilege of rooming in this building is reserved for regular students. Students rooming in this building furnish their own bedding and all furniture except bedsteads, dressers, and tables. Each girl pays $9.00 per semester for room, and a sum not exceeding 55 cents per week for lighting, heating, and incidentals.

As security for the payment of bills, all students living in College buildings are required to deposit $10.00 with the Treasurer, which deposit will be returned at the final settlement at the close of the semester. All the bills for each month must be settled at the Treasurer's office by the second Saturday of the following month.

All other students can secure furnished rooms and board in clubs or private families adjacent to the College grounds at from $3.50 to $4.50 per week.

The College Custodian, office in old office building, should be consulted by all new students, concerning rooms and rooming places, that undesirable rooms and houses may be avoided. For sanitary or any other reasons the College authorities reserve the right to forbid students from rooming in any particular house.

No group of young women students may establish a "house" or "home" without the full knowledge and approval of the President and the Dean of Women, nor make any definite plans in such direction. No young woman may become a resident of a sorority house until after she is an initiated member of the sorority.

The young women residents of Margaret Hall are required to board at the Margaret Hall boarding club.

Hospital Fee.—All students living in College buildings, and such others as desire to do so, pay a Hospital fee of $2.50 per semester. (See College Hospital).

Diploma Fee.—A diploma fee of $5.00 is payable before graduation.

Text Books.—All text books and stationery may be purchased at the College Book Store at about 20 per cent below the average retail price.

ADVANCED STANDING.

Students of other colleges will be admitted to advanced standing in this college under the following conditions:

First, they must present a letter of honorable dismissal;

Second, the entrance requirements to the college must be fully satisfied (see admission from other colleges under Entrance Requirements);

Third, students of other colleges will be admitted and granted such credits as their work will justify. Work of recognized merit that has been taken at Colleges and Universities of good rank and standing will be credited for an equivalent amount of work so far as it applies in any of the courses offered at this College. Students taking up work in this way will consult the Heads of the Departments to ascertain the credits to be allowed. These credits may, at the option of the Heads of the Departments, be conditioned on satisfactory work by the student during the first term in College;

Fourth, standings accepted by any Head of Department from any other College or University, shall be certified to the Recorder as "Accepted from .... College" or "Accepted from .... University," and these acceptances, after being verified by the Recorder, shall be so recorded in lieu of the regular standings;

Fifth, it is required that all credits from other institutions be sent by the proper officers of such institutions, duly certified, to the Recorder of this College, such certificates to include the number of weeks the student has pursued the studies in question and the number of hours' credit received in each term, as well as the portion of the subjects covered.

CLASSIFICATION AND STANDINGS.

Junior and Senior College.—The students are now classified in "Junior and Senior Colleges." The Junior College is composed of all students in the Freshman, and Sophomore years: the Senior College, of all students in the Junior and Senior years.

Amount of Work.—The amount of work in each course is expressed in hours, *an hour* meaning one recitation or its equivalent per week throughout the semester. It is considered that one hour's recitation or lecture will require as much time in the preparation, and hence is equivalent to a three-hour laboratory and receives the same credit. Any two-hour laboratory period is equivalent to two-thirds of a three-hour laboratory.

Number of Hours.—No student shall be allowed to classify in more hours than are specified in the catalogue for the semester of the course taken unless he has an exceptionally high record in his previous college work. The taking of such additional work is subject to the approval by the Dean under whom the student is classified and the Heads of the Departments in which the student is classified.

In general, students failing in any portion of a term's work will not be allowed to take full classification for the next semester.

Classification.—No student shall be admitted to any class or dropped from it, except by authority of the Classifying Officer.

Conflicts.—Students shall not classify in conflicting studies without the approval of the Classifying Officer and Heads of the Departments in which the student wishes to enroll.

Standing.—All the standings are based on the scale of 100. The passing grade is 75. A student receiving from 60 to 74 per cent inclusive in any course is conditioned, and allowed to make up the condition under the direction of the head of the department.

Back Studies.—Students shall be classified in back studies in all cases in which such studies are taught, subject to the first rule under Number of Hours. Any exception to this rule must be for good and sufficient reason, approved by the President of the College and the Dean or Head of the Department in which the student is enrolled.

No student shall be considered a candidate for graduation who has not at the beginning of the second semester of the Senior year completed his work to within the maximum number of hours regularly allowed in his course for that semester. If the uncompleted work is not offered in the second semester, it shall be passed and reported to the recorder not later than April 1st.

EXAMINATIONS IN BACK WORK.

Examinations for back work for matriculated students will be conducted at the opening of each semester, on the Tuesday and Wednesday preceding classification days.

TUESDAY.

8-10 A. M.	Farm Crops	Farm Crops Lecture Room, 307 Hall of Ag.
8-10 A. M.	Mining Engineering	Room 306, Engineering Hall
8-10 A. M.	Zoology	Zoological Lecture Room
10-12 A. M.	English	Rooms 1 and 3, Central Building
10-12 A. M.	Civil Engineering	Room 312, Engineering Hall
1- 3 P. M.	Mech. Engineering	Rooms 204 and 205, Eng. Hall
2- 4 P. M.	History	Room 208, Central Building
3- 5 P. M.	Public Speaking	Room 308, Central Building
3- 5 P. M.	Electrical Engineering	Room 207, Eng. Hall

WEDNESDAY.

8-10 A. M.	Horticulture	Hort. Lecture Room 208, Hall of Ag.
8-10 A. M.	Chemistry	Room 29, Chemical Hall
8-10 A. M.	Mathematics	Room 221, Central Building
8-10 A. M.	Animal Husbandry	An. H. Lecture Room 117, Hall of Ag.
0-12 A. M.	Economics	Room 222, Central Building
0-12 A. M.	Dairying	Dairy Building
0-12 A. M.	Botany	Room 312, Central Building
1- 3 P. M.	Civics	Room 102, Central Building
1- 3 P. M.	Mech. Engineering	Rooms 204 and 205, Eng. Hall
1- 3 P. M.	Domestic Economy	History of Art Room
2- 4 P M.	Modern Language	Room 119, Central Building
2- 4 P. M.	Agricultural Eng.	Agr. Eng. Lecture Room, Agr. Eng. Hall

3- 5 P. M.—Soils..................Soils Lecture Room 8, Hall of Agr
3- 5 P. M.—Physics............................Room 207, Eng. Hal

DEPARTMENTS MAINTAINED.

Agricultural Chemistry,
Agricultural Engineering,
Agronomy,
Animal Husbandry,
Bacteriology,
Botany,
Chemistry, General and Applied,
Civil Engineering,
Dairying,
Domestic Economy,
Economic Science,
Electrical Engineering,
English,
Farm Crops,
Forestry,
Geology,
History,
Horticulture,
Literature and Rhetoric,
Mathematics,
Mechanical Engineering,
Military Science,
Mining Engineering,
Music,
Modern Languages,
Physics and Illuminating Engin'ing
Psychology and Ethics,
Public Speaking,
Science and Agriculture,
Soils,
Veterinary Science,
Zoology.

GOVERNMENT.

The relations of our College buildings, and the nature of the exercises, complicated as they are, by laboratory work, shop practice, an labor, make order, punctuality, and systematic effort indispensable The institution, therefore, offers no inducement to the idler or the self indulgent. All who are too independent to submit to needful authority, too reckless to accept wholesome restraint, or too careless to tak advantage of their opportunities, are advised not to come. The discipline of the College is confined mainly to sending away those wh prove, on fair trial, to be of this class.

MANUAL LABOR.

The following regulations in regard to manual labor have bee adopted by the Board of Trustees:

1. The manual labor of students is divided into two kinds: viz. uninstructive labor, which shall be paid for in money; and instructiv labor, which shall be compensated by the instruction given and the skil acquired.

2. Uninstructive labor shall comprise all the operations in th workshop, the garden, upon the farm, and elsewhere, in which th work done accrues to the benefit of the College, and not to that of th student. Instructive labor shall embrace all those operations in th

workshop, museum, laboratories, veterinary hospital, experimental kitchen, upon the farm, garden and experimental stations, in which the sole purpose is the acquisition of knowledge and skill.

3. Students shall engage in instructive labor in the presence of the professor in charge, and under his instruction according to the statement made in each of the courses of study.

The compensated labor furnished by the Divisions of Agriculture, of Veterinary Medicine, and of Engineering, is given by each to its own students and is eagerly sought. The "details" of compensated labor supplied by the needs of the various departments are given to the most faithful and meritorious students in each department. Uninstructive labor is paid for according to its value to the College, but no student should expect to pay the main part of his expenses by labor while here. The College cannot furnish the work, and, even if it could, the student's time is *needed chiefly for study.* Still, many worthy and industrious students pay a considerable part of their expenses by labor, over $4,000 being paid out by the College thus each year to students and post-graduate assistants.

GRADUATING THESIS.

All candidates for graduation in the Engineering and Agricultural ourses are expected to present a satisfactory thesis.

The subjects for theses shall be selected under the direction of the rofessor in whose department they are written, and submitted to the hesis Committee, with signed approval of the professor, on or before he first Monday in October.

It is expected that each thesis shall represent an amount of work quivalent to at least one exercise per week through the Senior year; at it shall show the result of the student's personal study or investi-ation and be throughout original in matter and treatment so far as e nature of the subject will permit; that it shall be prepared under e supervision of the professor in charge, the student making frequent ports of progress and having an outline of matter ready for approval y the first week of the last semester.

The complete thesis shall be submitted to the Thesis Committee or before May 25th.

COLLEGE HOSPITAL.

The actual sanitary condition of the College is excellent. The ildings are situated on high ground with good natural drainage. The ter supply is exceptionally pure and abundant. The sewer system d sewerage disposal plant are the best that modern sanitary engi-ering can devise. Nevertheless in this, as in other like institutions, ose students are drawn from a wide territory, various diseases are ought by the students themselves. In order to control epidemics and properly to care for other cases of illness or injury, two hospitals are provided. These hospitals are under the charge of the College Physician, assisted by a professional nurse, a competent housekeeper, and a student hospital steward.

The expenses of the hospitals are defrayed from a fund accruing from the hospital fees paid by students. A hospital fee of $2.50 per semester is required of all students living in College buildings. The privileges of the hospitals are also extended to students not rooming in the College buildings, provided: 1st, that the physician shall be paid for calls at their residences; and, 2d, that the usual hospital fee shall be paid within the first ten days of the student's arrival. Students not making the hospital deposit will be admitted to the hospital upon the basis of $10.00 per week, within the discretion of the college physician. The hospital fee insures to the payer thereof, medical attendance, nursing, and medicine, in illness or accident; and consultation and medicine for minor ailments in accordance with the regulations herein published. The charges named are based upon the probable actual cost of medical attendance and hospital service, and the fund created is carefully devoted to these purposes. The College can not assume any liability beyond the extent of the fund so created. The hospital has proved to be a great blessing to the students.

The following regulations apply to the privileges of the hospital:

1st. Students entering the hospital shall be charged $3.00 per week for board, room, light, and heat. But for any time in excess of three consecutive weeks per term spent in the hospital, an additional charge above that mentioned shall be made of $4.00 per week.

2d. In case a special nurse or physician is employed, the expense shall be borne by the particular patient, the selection of such nurse or physician to be approved by the College physician.

3d. The College assumes no responsibility whatever in case of smallpox; nor shall the privileges of the hospital be extended to such cases.

4th. The President and the College physician may require of students entering the college a certificate of a reputable physician showing successful vaccination.

5th. The College physician is authorized to exclude from the College dormitories and recitation rooms any person afflicted with a contagious disease.

COLLEGE LIBRARY.

The College Library, consisting of over 30,000 volumes and of about 10,000 pamphlets, is chiefly a library of reference, containing standard and technical works bearing particularly upon the lines of study pursued in the College. Magazines, periodical literature bearing upon the special work of the students, and daily papers are furnished for the use of the students. The reading room of the library is open eleven and one-half hours daily except Sunday, when it is open three hours. Personal assistance will be given by the librarian and her assistant to any who desire help in reference work.

A few years ago the College received by bequest about 1,500 volumes pertaining to Engineering and Economics from the library of the late Geo. W. Catt. This Engineering Library, with that section of books from the general collection, has been made a Departmental Library, located in Engineering Hall. An Agricultural Library has been established, also, in the New Hall of Agriculture.

RELIGIOUS LIFE AT THE COLLEGE.

ORANGE HOWARD CESSNA, CHAPLAIN.
M. H. BICKHAM, GENERAL SECRETARY, Y. M. C. A.
MISS FLORENCE ARMSTRONG, GENERAL SECRETARY, Y. W. C. A.

Although we have here a state school, and hence one non-sectarian, the College life is dominated by religious influences.

The Young Men's and Young Women's Christian Associations, Bible Study Classes, and Mission Classes, consisting of members from both faculty and student body, have a helpful influence not only upon the religious but also upon the social life of the College. The members of the Associations assist in the reception of the new students and in the maintenance of religious work.

The work of each Association is under the direction of a general secretary. These two Associations are now located in their new home, "Alumni Hall," which was constructed at an expense of $60,000.00, by funds donated by the alumni, students, instructors, citizens, and friends. This home is the center of the religious and social life of the College and as a building for such purposes it is not excelled in the West.

The faculty and students assemble daily in the Chapel at 9:40 A. M. for public worship. On each Sunday morning at 10:45, Chapel exercises are conducted by some prominent clergyman invited for the occasion. In all these services, the object is to emphasize the principles of morality and of the Christian religion.

There are nine different denominational churches in Ames, all of which are closely in touch with the students and cordially invite them to take part in all religious services.

ALUMNI ASSOCIATION.

The Alumni Association of the Iowa State College was organized in 1876. Its purpose is to promote the highest interest of the institution and to increase friendship and sympathy among students and alumni.

The present officers of the Association are: E. W. Stanton, '72, Honorary President; J. F. Porter, '84, President; B. W. Crossley, '07, Secretary; Mrs. Julia W. Stanton, '88, Treasurer; Mrs. Mary McDonald Knapp, '83, Historian; Mrs. M. K. Smith and Dr. E. W. Stanton, Executive Committee; and G. W. Patterson, '09, Business Manager of Alumnus. The annual business meeting and banquet are held on Wednesday and Thursday of Commencement Week. A local association was organized in April, 1903, in order to arrange for the annual meetings and to keep the alumni in close touch with one another. Branch associations have been organized in Des Moines, Washington, D. C., New York, Pittsburg, Chicago, Philadelphia, Schenectady, St. Louis, Kansas City, and Seattle.

Alumni Hall adds much to the Association, as it affords a place where the alumni may meet when visiting their Alma Mater.

COLLEGE PUBLICATIONS.

1. Catalogue, published in February, and giving general information about the College and its several departments.
2. College Compendium, an illustrated catalogue of the school.
3. Special announcements of the Agricultural, Veterinary, and Engineering divisions, and of the Short Course and Good Roads School, one bulletin being published each month.
4. Bulletins, recording the results of experimental studies carried on by the Agricultural and the Engineering Experiment Stations.

STUDENT AND ALUMNI PUBLICATIONS.

1. The Student, a weekly paper, published by a staff elected from the student body and devoted to the recording of such matters as pertain to the interest and welfare of the school.
2. The Bomb, an annual published by the Junior Class.
3. Iowa Agriculturist, published monthly by the Agricultural Club of the Iowa State College.
4. Iowa Engineer, published bi-monthly by the Engineering Association.
5. The Alumnus, a monthly publication, devoted to and published by the Alumni Association.

LITERARY SOCIETIES.

The work of the eleven literary societies serves not only to supplement the social and literary work of the College, but also to aid the student in securing that training so necessary to enable one to appear before an audience, that training which every student needs and which cannot be secured in the class room alone. It is the purpose of the officers of the College to keep each Friday evening open that the work of these societies may go on without interruption. Every student is invited, even urged, to join one of these societies.

DEBATING LEAGUE.

The Debating League is an organization composed of the Bachelor, Beardshear, Crescent, Phileleutheroi, Philomathean, Pythian, Welch, and Forum literary societies. Its function is to arrange for and to carry out debates, both inter-society and inter-collegiate. There is an inter-society debate each semester, calling out four students from each society. Of these four students, two maintain the affirmative and two the negative of the same proposition on the same night against opposing teams from other societies. During the year the inter-society contests give opportunity for forty-eight students to engage in vigorous debate, and many others get practice in trying to win a place on their society teams. During the fall semester a dual debate is held with the Iowa State Normal School, thus calling out six debaters from each school. The triangular inter-collegiate debate with Drake University and Iowa College held during the spring semester also calls for six students to represent the Iowa State College. On the second Friday in April, 1910, the first dual debate will be with the University of South Dakota. All these debates arouse great interest in the College world, and, to the participants, they bring unmeasured profit.

ORATORICAL ASSOCIATION.

The Oratorical Association is composed of three members from each of the literary societies and three from the faculty. This association, by providing for joint public programs, declamatory and oratorical contests, and society graduation, helps to increase the interest in the general literary work of the school.

Inter-society oratorical contests are held each fall semester and declamatory contests each spring semester, each society having one representative. The winner in the inter-society oratorical contest represents the College in the annual inter-collegiate contest in which Penn, Parsons, Upper Iowa University, Cornell, Des Moines, Coe, Lennox, Leander Clark, Tabor, Central University, Beuna Vista College, and Iowa State College are represented.

MUSICAL ORGANIZATIONS.

The College maintains a Choral Society (membership being open both to students and to citizens of Ames), a College Choir, a Glee Club, and a Ladies' Glee Club, all of which give frequent concerts and recitals. The musical organizations are under the supervision of the Director of Music.

A College Band of thirty-two pieces is maintained under the instruction of Charles L. Mundhenk, a member of the Iowa State Band of 1893. This band furnishes music in connection with the Military Department and also for all athletic and student assemblies.

Graduate Courses

GRADUATE COURSES.

The Iowa State College offers the degree of Master of Scientific Agriculture (M. S. A.) to Bachelors of Science in Agriculture who are graduates of this College or to others offering equivalent courses of study, the degree of Master of Science (M. S.) to Bachelors of Science who are graduates of this College or of other colleges offering equivalent courses of study, the degree of Master of Agricultural Engineering (M. A. E.) to Bachelors of Science in Agricultural Engineering who are graduates of this College or of other Colleges offering equivalent courses of study, and also Professional degrees in Engineering.

MASTER'S DEGREE.

The opportunity for resident study ofter graduation is a privilege granted only upon the recommendation of the President with the advice and consent of the Committee on Post-Graduate Study and the professors in charge of the departments in which the studies are to be pursued.

The candidate shall spend at least one academic year in residence. If only one year is spent in residence, the candidate shall devote his entire time to his post-graduate studies, except in cases where work previously done *in absentia* is accepted at the beginning of the student's residence by the Professor in charge of the major subject. Such *in absentia* work shall constitute not more than one-half of the required work. In the case of graduates of this college, temporary leave of absence for special study elsewhere may be granted during the year's residence. In order to be entitled to his degree, the candidate must meet within four years the requirements existing at the time of matriculation, otherwise he must complete any additional requirements which may be in force at the time of his final examination.

Two lines of work shall be selected, designated as major and minor studies, the former to be given two-thirds and the latter one-third of the time. The major study shall be research work, the results of which shall be incorporated in a thesis. The major and minor studies shall be so selected as to support and strengthen each other. No under-graduate study shall be selected as a major study. Under-graduate studies may be taken for part of the minor work only with the approval of the Committee on Post-Graduate Study, and the heads of the departments in which the work is to be done. The candidate shall have a reading knowledge of French or German.

Application for graduate study, specifying the departments in which the major and minor subjects are to be taken, shall be filed with the President within four weeks of the beginning of the first term's resident work, which, in all cases, shall be not later than October 1st, next preceding the commencement at which the degree is to be granted.

A detailed outline of the work to be done in the major and minor subjects approved by the heads of the departments in which the work is to be taken shall be filed with the Committee on Post-Graduate Study, within eight weeks of the opening of the semester in which resident work is begun.

The candidate for the master's degree shall apply in writing for examinations not later than May 1st; and such examinations shall be given not later than May 15th.

Graduates of other institutions desiring to become candidates for post-graduate degrees in this institution shall be required to show to the Committee on Post-Graduate Study evidence of under-graduate work equivalent to the corresponding course in this institution, and if any deficiency appears in the subjects elected for post-graduate work, to make up such deficiency.

Candidates for advanced degrees are expected to appear on the Commencement stage to receive such degrees.

FEES.

A matriculation fee of fifteen dollars ($15.00) is charged to all graduate students. This fee is paid at the Treasurer's Office and the receipt shown to the chairman of the Post-Graduate Committee at the time of first registration.

Laboratory fees are charged in each laboratory for the material used, the amount being arranged with the Head of the Department.

Diploma fee for Master's Degree is five dollars ($5.00).

PROFESSIONAL DEGREES IN ENGINEERING.

The several departments of the Division of Engineering confer the following professional degrees: In Mechanical Engineering, the degree of Mechanical Engineer, (M. E.); in Civil Engineering, the degree of Civil Engineer, (C. E.); in Electrical Engineering, the degree of Electrical Engineer, (E. E.); in Mining Engineering, the degree of Mining Engineer, (E. M.).

Applications for professional engineering degrees will be received from graduates of the engineering departments of this College or from other colleges offering equivalent courses of study in engineering.

A graduate of any of the four-year engineering courses, to be entitled to the professional degree, shall have devoted not less than one year to resident study along lines satisfactory to the engineering faculty, shall have been engaged for not less than one year in a responsible professional position, and shall present a satisfactory thesis, or he shall have been engaged for not less than five years in a responsible professional position and shall present a satisfactory thesis.

A graduate of any of the five-year engineering courses shall have devoted not less than one year to successful professional work and shall present a satisfactory thesis.

In this connection a responsible professional position means practical engineering experience, requiring the exercise of skill or executive ability in designing or construction work. References or personal knowledge of the facts will be required by the engineering faculty.

Further information as to the lines of work open to graduate students can be found under the courses of study described elsewhere.

GRADUATE WORK IN AGRICULTURE.

AIMS AND METHODS.

It is the aim of the College of Agriculture to furnish facilities for advanced study commensurate with the demand. By means of this advanced work the College seeks to awaken in the minds of capable men and women an appreciation of research and the advancement of learning, to the end that they may effectively aid, not only in the teaching of agriculture, but also in extending the boundaries of agricultural knowledge. Nearly all of the best positions open in agricultural research and instruction work now require post-graduate training.

The College of Agriculture aims to give advanced instruction of a high character in each of its departments. No set courses of study leading to the Master's degree are provided, but each candidate for this degree pursues an independent line of special research, original in character, outlined with the advice of the professors, and carried out under their direction. Seminars are largely employed and especial efforts are made to bring the graduate student into contact with the research problems of his department of study. To this end capable students often take a part in the investigation work of their instructors.

EQUIPMENT.

The College of Agriculture is well equipped for Graduate work. Each of the departments is provided with commodious laboratories which are fitted up with apparatus and equipment of the most approved design. In addition, large herds and flocks, a large number of field plots devoted to soil and crop investigations, and extensive orchards and plant breeding grounds offer the student excellent facilities along Animal Husbandry, Agronomy, and Horticultural lines. The Dairy and Agricultural Engineering departments have buildings and equipment which are unsurpassed for work in their respective fields. A splendid library has recently been installed in the new Hall of Agriculture which provides unusual facilities for graduate students. Within the past few years hundreds of valuable books containing the results of the most noted foreign investigators have been added to this library.

In the following pages will be found grouped together the lines of agricultural work which are offered graduate students.

FARM CROPS.

Graduate work in Farm Crops comprises investigation of biological phenomena of growing crops, with a view to recognizing the operation of the laws of plant breeding. It also includes an opportunity for investigation of station methods and for putting them into practice.

Cereal Breeding: An opportunity is given through the records of the Experiment Station, and through actual work in progress on the experimental field, to investigate the operation of the laws of plant breeding as applied to farm crops. This investigation will include an extended study of correlations of characters in growing strains of corn and small grain. A study of the transference of characters in generations of plants of hybrid origin gives an excellent opportunity for tracing Mendelian principles.

Experiment Station Methods: Special opportunity for practice in experiment station methods of conducting scientific tests of farm crops are offered on the extensive experimental grounds of this institution. Besides making a study of the methods in vogue at this station, an opportunity is given for an investigation of the methods in operation at other leading experiment stations of this country.

General Crop Problems: Unsolved problems of growth and the harvesting and storage of the several cereal crops offer inviting lines for valuable research. The commodious laboratories of the Farm Crops Department, equipped with the best apparatus available, enables the investigator in this line to conduct satisfactory, scientific research into the many important unsolved problems.

SOILS.

Graduate work is offered in Soils which prepares the student for special work in the United States Bureau of Soils or in Colleges and State Experiment Stations. The work may be a continuation of work taken as an under-graduate in this College or of any line of soil study which has fitted the student to take up advanced work.

The graduate student will find excellent opportunities for investigations in soils along the following lines:

Soil Physics: Research in special subjects bearing on the physical characteristics of soils and their relation to crop production.

Soil Fertility: Special investigation of the factors which control the productive capacity of soils.

Soil Bacteriology: Original investigations of important problems in Soil Bacteriology, the department offering unusual opportunities along this line, especially in connection with the humus investigations which are now in progress.

Research in Soil Management: Investigations of the principles governing successful systems of soil management. Special studies relating to the management of particular soils such as gumbo, peats, sands, and alkali soils.

Seminar: Special investigation bearing on selected lines in Soils. The preparation and presentation of papers for discussion by the class.

DAIRYING.

Graduate work in dairying can be taken along any one of the following lines:

Buttermaking: The large, well equipped factory offers abundant opportunity for anyone desiring to specialize along this line. It gives facilities for advanced work in cream ripening, pasteurizing, starters, churning, separating, etc.

Creamery Management: Under this head investigational work is done along such lines as; cost of manufacture, economical methods of purchasing cream and supplies, disposal of the by-products of the factory, and improved methods of creamery accounting.

Cheese Making: The large, well equipped cheese room and cold storage rooms connected with it make a very complete laboratory in which to carry on investigational work in comparing different methods of making, curing and storing various kinds of cheese.

Testing Dairy Products and Milk Inspection: These subjects offer a great field for research, including comparisons of quick methods of analyzing the various dairy products with the well established officia method and a study of improved methods of testing for preservatives and adulterations.

Advanced Work in Dairy Bacteriology: This work consists of laboratory investigation of problems along dairy bacteriology lines and assigned reading. The nature of the work is designed to fit the individual student.

ANIMAL HUSBANDRY.

Graduate work in Animal Husbandry may be taken along any of the following lines:

Animal Nutrition: Because of the large number of horses cattle, sheep and swine-feeding experiments which are being conducted on the College Farm, the opportunities for doing research work in this line are unequalled.

Animal Breeding: Includes special work along new and original lines pertaining to principles underlying Animal Breeding.

Study of Breeds: With not only typical specimens, but also, in most cases, complete breeding herds of almost every recognized breed of live stock on the continent, the post-graduate student is offered unexcelled opportunity for studying breeds adapted to Iowa conditions.

Stock Judging: For this work, all the various market types of animals and good representatives of pure breeds are available. These are carefully studied on foot, then slaughtered for a block test and the exact percentages and values of various cuts determined.

Practical Management of Stock: This consists of a study and investigation of the methods employed on the best managed stock farms and breeding establishments in the United States, Canada, Great Britain, and other countries. Students are thus prepared to manage stock farms.

POULTRY HUSBANDRY.

Because of the newness and great scope of the field, Poultry Husbandry offers many opportunities for doing valuable research work. Unexcelled opportunities are offered for the common application of training which the student may have received in embryology, bacteriology, physics, zoology, entomology, farm architecture, etc. Some of the lines along which the student may work, are:

Breeding: Because of the shortness of generations and the widely varying characteristics in color and shapes of varieties, poultry offers unexcelled opportunities for study of unit characters in crossing and in applying the laws of heredity. Work may also be done along the ines of breeding for meat type and increased egg production.

Feeding: Comparative studies are made of different rations for aying and breeding stock, rearing and fattening, or finishing. Comparison is made of breeds in regard to gains made on certain rations. Tests are also made of the effect of feeding on color of feathers or omposition of flesh and eggs.

Housing: The work covers comparison of glass front, curtain ront, or combination glass and curtain front houses; a comparison of arge and small flocks; a study of colony houses and of poultry house anitation.

Incubation: This branch of the industry is in great need of nvestigation because of its vast importance and the little knowledge e now have of its laws. Such lines of work could be taken up as:

effect of moisture or non-moisture methods on the fertility of eggs and the vitality of chicks; value of carbon dioxide in incubation; study of natural methods; loss in weight in incubation; change in the structure and density of the shell; selection of chicks as they hatch for constitutional vitality; difference in incubation management for eggs of different classes of poultry.

Brooding and Rearing: Brooding in large versus small flocks; natural versus artificial brooding; study of brooder diseases; effects of temperature on health and growth of chicks—all these are part of the course.

Poultry Diseases and Pests: This includes a study of cholera, sorehead, black head, roup, and other poultry diseases with a view to prevention and cure, and also a study of lice, mites, rats and other pests, with a view to their extermination.

HORTICULTURE AND FORESTRY.

Graduate students find here opportunity for investigation in Horticulture and Forestry in the following subjects. Work in Forestry is offered for minor subjects only:

Plant Breeding: The investigation of principles and methods of plant breeding. The plant breeding work of the Iowa Experiment Station is continually developing an abundant supply of material for the study of heredity, variation, and selection, particularly with the apple.

Plant Propagation: The greenhouses, garden, and orchards are available for investigations concerning the principles and technique of plant propagation.

Pomology: A special study of horticultural species with reference to their original geographical distribution, to their variation under cultivation, and to the development of distinct types and economic importance.

Research: Problems for horticultural investigation other than those suggested above, undertaken in special lines for which the students may be best prepared.

Forest Botany, or Dendrology: Systematic and biologic forest geography.

Silviculture: The methods of producing a forest crop and of influencing its progress.

Wood Technology and Timber Physics: The structural and physical characters of woods, with the application of wood in the arts, with its requirements and working properties, and with the use of minor and by-products.

Forest Economics: A study of the relation of forests to climate, soil, water, health, ethics, etc. This is a study of commercial peculiarities and of the positions of forests and forestry in political economy.

Forest Mensuration: Methods of ascertaining volumes and rates of growth of trees and stands of determining yields.

AGRICULTURAL ENGINEERING.

Students may take up graduate work along any of the many lines of Agricultural Engineering. This training will prepare them for government positions in agricultural engineering lines, for teaching in agricultural colleges, or for becoming managers or superintendents of farms. Investigation may be carried on along any special lines which they are fitted to pursue. The following subjects are suggested:

Irrigation: Studying the principles employed and the machinery used and its efficiency, also practical work in sewage irrigation on the College Farm.

Farm Architecture: The locating, designing, constructing, drawing up specifications and contracts, and estimating cost of all farm buildings.

Road Construction: Intended to fit students for highway engineers.

Investigation of Farm Implements: Their construction and efficiency, also comparison of different makes. The department, having an equipment of $20,000.00 worth of modern implements, offers splendid opportunities for this line of investigation.

Farm Motors: The efficiency of steam traction and gasoline engines, also a comparison with the horse as power.

Drainage: Intended to fit students for drainage engineers. The co-operative experiments of this department with the United States Department of Irrigation and Drainage Investigation, furnish a good opportunity for study along this line.

GRADUATE WORK IN SCIENCE.

Graduate courses are offered in the departments of Bacteriology, Botany, Chemistry, Geology, and Zoology. Most of the lines of work here suggested are planned particularly for those students of exceptional ability who expect to become investigators or teachers in the respective subjects.

BACTERIOLOGY.

Students who have sufficient preparation in Chemistry and Bacteriology may pursue graduate work along any of the following lines:

General Bacteriology: A study, systematic, cultural, or physiological of a group of bacteria.

Sanitary Bacteriology.

Fermentations or Zymotechnique: The equipment and laboratories in Central Hall are at the disposal of those who wish to do advanced work along general bacteriological lines.

Veterinary and Pathogenic Bacteriology: Upon the completion of the laboratories for Veterinary Bacteriology in the new Veterinary building, an excellent opportunity for research or advanced work in this topic wil be afforded.

Soil Bacteriolgy: The location of these laboratories in connection with those in Soils insures an exceptional opportunity for graduate and research work.

Dairy Bacteriology: Laboratory investigations may be carried on with all the necessities and conveniences at hand in the way of apparatus. The extensive equipments of the College creamery and the College dairy farm are at the service of those wishing to work upon problems which have a practical bearing.

BOTANY.

The department has as equipment a large and extensive herbarium, containing representative families of the lower and higher plants, besides numerous exsiccati and a large collection of seeds and grasses, also an economic collection containing the more important food and useful plants. The department has a good equipment of microscopes and various accessories and other apparatus necessary for the pursuit of graduate work. The graduate work may be grouped under the following heads: Physiology, Morphology, Systematic and Economic Botany.

Advanced Ecology: A course in which the various features underlying the distribution of plants are considered, with reference to soil, moisture, and the distribution of plants and the relation to other floras.

General Physiology: An advanced course in general physiology in which the student will take up some specific problem in plant physiology, such as the germination of seeds under different conditions.

General Morphology: A comparative study of some group of plants, especially along the lines of development and embryogeny. A study of the anatomy of seeds or of some special organs of plants.

Advanced Course in Thallophytes: The morphology of some particular group of lower forms.

Advanced Morphology of the Flowering Plants: A comparative study of the morphology of the flowering plants.

Systematic Botany: A study of some special group of flowering plants or of some special group of the Thallophytes, especially plants of economic importance and those in some way related to agricultural and horticultural problems.

Applied Botany: A study of the more important food plants of man, their economic uses, and their distribution with reference to climatic conditions with a special study of the part of the plant that is used as food.

Advanced Mycology: A study of some specific group of plant diseases with its life history, structure, and development.

Microscopical Examination of Foods: A study of some particular form of food from a microscopical standpoint, the student selecting for himself the foods used by man or those used for stock.

Seed Testing: A study of some specific problem connected with the impurities of seeds and adulterations, as well as with the structure of the seed.

Poisonous Plants: An advanced course in poisonous plants, to be given only to those pursuing some minor work in the Department of Chemistry, and those who have some general knowledge of General Bacteriology.

Theses and Themes: A thesis embodying the results of some special line of work must be presented four weeks before the close of the semester, by those who major in botany. For students who take a minor, a theme must be prepared. Candidates in major and minor work must be generally well informed on botanical subjects and should be familiar with botanical literature.

CHEMISTRY.

The Chemical Department provides work either as a major or minor line of study for students who are candidates for the master's degree. This work is offered as a major line of study to graduates of this College or of any other colleges of equal standing who have at least twenty hours of credit in this subject in work that is equivalent to courses 2, 5, 9, and 11, or to 21, 23, 25, and 26, or to 22, 24, 9, and 11. As a minor line of study the candidate must present at least fifteen credit hours in the subject corresponding to courses 2, 5, and 9.

The courses of study will be along the lines of Applied or Industrial Chemistry with a sufficient ground work of theoretical study to give a rational explanation and conception of the processes involved. The graduate student will select work along some one of these general lines of study and will devote his time to this, supporting it by other necessary collateral study, and such research in the literature of the subject as the library facilities will permit. A good reading knowledge of the German language will be essential to the best progress in the prosecution of the work. Minor subjects in this department will be arranged so as to help as much as is possible the major subjects selected in the other departments. The lines of chemical study are arranged under the titles, Agricultural Chemistry, Industrial Chemistry, Special Organic Chemistry, and Analytical and Synthetical

Chemistry. Under each head a variety of work is offered, the courses being arranged for each applicant. For the outline of courses see under Chemical Department.

GEOLOGY.

The department of geology offers the following advanced courses in geology:

Physical and Optical Mineralogy: The course includes a careful study of the physical and optical properties of minerals both macroscopic and microscopic. Especial stress is put upon the use of the compound microscope in the study of thin sections. Idding's translation of Rosenbusch's "Mickroscopische Physiographie" of the common rocking minerals serves as a basis for the course. Essentially a laboratory course.

Microscopic Petrology: This is a continuation of the preceding course in which the larger part of the time is spent in a study of the microscopic study of the igneous rocks. Some time is also spent in the mechanical analysis of rocks by heavy solutions. It is essentially a laboratory course, but is accompanied by lectures on the occurrence, association, and origin of the leading rock types.

Advanced Structural Geology: The course consists of a critical study of rock alteration, including weathering and metamorphism. Problems in structural geology, especially those related to the crystalline schists, receive due attention. It is mainly a lecture and reading course.

Mining Geology: The work, conducted by lectures, reading, and conferences, includes a critical study of the occurrence, distribution, and origin of ore deposits and of the geological problems relating thereto.

Advanced Areal and Stratigraphic Geology: The work is based chiefly on a study of the stratigraphy of the United States, but it includes work on correlation and the comparative stratigraphy of the world. Practical work in field mapping is required.

ZOOLOGY.

Opportunity for graduate work is offered, especially along the following lines:

Economic Entomology: In addition to the facilities offered in the department proper, graduate students can take advantage of the investigation work carried on in the Entomological section of the Experiment Station. A well-equipped insectary is available.

Systematic Entomology: The systematic collections of insects are large, and in some groups, particularly in the Hemiptera, are scarcely excelled in this country. A large number of types are included.

Vertebrate Morphology: While courses will be laid out in the comparative morphology of various systematic groups or of various systems of organs, the comparative morphology and physiological anatomy of the brain is especially emphasized.

Human Physiology: Equipment is available for most lines of physiological research, but particular attention is paid to studies on nutrition.

Division of Agriculture

Division of Agriculture

CHARLES FRANKLIN CURTISS, DEAN.

SPENCER AMBROSE BEACH, VICE-DEAN.

The division of Agriculture offers to its students work in any of the following courses:

Course in Agronomy.

Course in Dairying.

Course in Animal Husbandry.

Course in Horticulture and Forestry.

Course in Agricultural Engineering.

Course in Science and Agriculture.

These courses are so arranged as to furnish a good foundation from which a student may become either a successful farmer or may develop into a specialist in one of the many branches of the agricultural industry. The department offers short as well as the regular four year courses, the difference being due largely to the degree in which the student wishes to specialize in any line of work. The farm as it is usually conducted is a union of many divisions of industry, and the shorter course confines itself to laying a foundation that will secure success in all of these, while the longer course seeks to direct the student into that line which will call forth and centralize his special ability and at the same time enable him to meet the variety of conditions that under all circumstances surround a successful life.

Past experience with these courses shows that they have met with more than the usual success in attaining their objects; as the shorter course has been productive of many successful farmers, and the longer course has been unusually successful in developing better farmers and more capable men in practical life and also in securing for our graduates prominent positions in the agricultural faculties of other colleges.

In the courses in practical agriculture, a field of work which is unsurpassed by any other college in the United States is open to our students. The national government gives to the college about thirty-five thousand dollars annually for original experimentation and instruction in agriculture and the sciences related to this industry. This supplemented by liberal state aid, enables the College authorities to make the fields and the barns veritable laboratories of extensive and most practical investigation and observation. The range is from the soil which produces, through all of its natural characteristics to whatever is grown in agriculture from germ to finish.

The farm consisting of 1,200 acres of rolling prairies, bottom and woodland is stocked with good representatives of six breeds of horses, seven breeds of cattle, seven breeds of sheep and six breeds of hogs. These animals are used in class illustration and for the various experiments in breeding and feeding for milk, meat, wool, growth and maintenance, conducted by the Experiment Station as a department of the College. All the crops are grown for some educational purpose; all the animals are fed by rule and system, and the result of their management reported upon and used in class work.

Two commodious, well-lighted stock judging pavilions have recently been constructed, into which live animals are brought in the presence of the teacher and the class for careful study and intimate knowledge. An experimental barn with the recent and most approved methods of stalls, feeding and ventilation, is devoted exclusively to the original work of animal husbandry and agronomy, the work ranging over all the questions of breeding and maturing domestic animals.

The work of this department is designed to teach the sciences that underlie practical agriculture, and sufficient English, literature, mathematics, history, and other supplementary studies to sustain both scientific and practical agriculture and to develop the agricultural students to the level of the educated in any profession. Special attention is given to the improved methods in all of the various operations of farming, farm building, use of tools and machinery, and management of all kinds of stock and crops. The instruction embraces not only the principles, but also the practices of agriculture.

AGRICULTURAL COURSES.

All students classified in the courses in Agronomy, Dairying, Animal Husbandry and Horticulture will take the same work until the beginning of the Sophomore year, when the selection of the desired course will be made by the student. Students classified in the courses in Agricultural Engineering and Science and Agriculture will take the Freshman work as shown in the list of studies given for those courses.

**Freshman Year.

FIRST SEMESTER.

		Required Semester Hours
Agricultural Engineering 1 or 2,	Shop Work	1⅓

Animal Husbandry 1,	Market Types of Cattle and Sheep	2
Farm Crops 1,	Corn Growing and Judging	2⅔
Horticulture 14,	Farm Forestry	2⅔
Veterinary 56,	Anatomy of Domestic Animals	1
English 10,	Narration and Description	3
Mathematics 17,	Algebra and Trigonometry	3
History 19,	The Making of the Nation 1783-1817	2
Military 1,	Military Drill	..
Library 1,	Library Instruction (4 hours during semester)	
	Total semester hours	17⅔

**Freshmen who show deficient preparation in English or Mathematics may be assigned by the Dean of the Junior College and the Dean of Agriculture, to special classes, with one hour more work than indicated above, and in case of clear indication of failure in either of these subjects, even with this arrangement they will be dropped from the Freshman work in this line until they have given proof of sufficient preparation to enable them to carry the work successfully.

SECOND SEMESTER.

		Required Semester Hours
Agricultural Engineering 1 or 2,	Shop Work	1⅓
Animal Husbandry 2,	Market Types of Dairy Cattle, Horses and Swine	2
Dairying 12,	Farm Dairying	2⅔
Farm Crops 2,	Small Grains	2⅔
Horticulture 2,	Plant Propagation	2⅔
English 11,	Exposition	3
Physics 205,	Mechanics, Heat and Light	3
Military 2,	Military Drill	..
	Total semester hours	17⅓

Department of Agronomy

Agronomy is the science of the Field and its crops. It treats of Farm Management, the application of economic business methods to farm practices; Field Crops, their classification, production and improvement; Soils, their fertility, cultivation and improvement. The Department of Agronomy consists of the two coordinate Departments, Farm Crops and Soils.

COURSE IN AGRONOMY.

For Freshman year see Agricultural Course, page 77.

Sophomore Year.

THIRD SEMESTER.

		Required Semester Hours
Agricultural Engineering 4,	Farm Engineering	3⅓
Farm Crops 3,	Corn Breeding and Judging	2
Animal Husbandry 3,	Breed Types of Cattle and Sheep	3⅓
Horticulture 4,	Plant Breeding	3
Botany 24,	Embryogeny	1
Agricultural Chemistry 21,	Elementary Experimental Chemistry	5
English 12,	Argumentation	2
Military 3, or Athletics		..
	Total semester hours	19⅔

FOURTH SEMESTER.

		Required Semester Hours
Agricultural Engineering 5,	Farm Machinery and Farm Motors	2⅔
Farm Crops 4,	Grain Breeding and Judging	2
Animal Husbandry 4,	Breed Types of Dairy Cattle, Horses and Swine	3⅓
Zoology 16,	General Zoology	5
Agricultural Chemistry 23,	Elementary Experimental Chemistry	5
Military 4, or Athletics		..
	Total semester hours	18

Junior Year.

FIFTH SEMESTER.

		Required Semester Hours
Soils 1,	Soil Physics	4
Agricultural Chemistry 25,	Agricultural Analysis	4
Animal Husbandry 21,	Principles of Breeding	2
Zoology 4,	Entomology	4
Economic Science 9,	Outlines of Economics	3
Choice *Farm Crops 19, *Soils 17,	Seminar ½ Seminar ½	½
*These courses must be continued through the year. Final standing will not be certified to recorder until close of sixth semester.		17½
Electives will be selected from the list on page 134.		½ to 2½
	Total semester hours	18 to 20

SIXTH SEMESTER.

				Required Semester Hours
	Soils 2,	Soil Fertility		4
Choice	Farm Crops 9,	Research Work	2	2
	Soils 3	Research Work	2	
	Bacteriology 1,	General Bacteriology		4
	Botany 11,	Vegetable Physiology		4
	Farm Crops 17,	Grasses, Forage and Fibre Crops		2
Choice	*Farm Crops 19,	Seminar	½	½
	*Soils 17,	Seminar	½	
	*A continuation of work in fifth semester. Standing will be for fifth and sixth semesters. One hour credit for both semesters' work will be recorded at end of the sixth semester.			— 16½
	Electives will be selected from the list on page 134,			0 to 3½
				— — Total semester hours 16½ to 20

Senior Year.

SEVENTH SEMESTER.

				Required Semester Hours
	Soils 6,	Advanced Soil Fertility		2
	Farm Crops 8,	Farm Management		3
	Soils 8,	Soil Bacteriology		3
Choice	Soils 4,	Research Work	2	2
	Farm Crops 9 or 10,	Research Work	2	
	Animal Husbandry 20,	Animal Feeding		2
	**Horticulture 3,	Orcharding		2⅔
Choice	*Farm Crops 20,	Seminar	½	½
	*Soils 18,	Seminar	½	
	*These courses must be continued through the year. First standing will not be certified to recorder until the close of the eighth semester.			— 15⅙
	Electives will be selected from the list on page 134,			⅚ to 4⅚
				— — Total semester hours 16 to 20

**The classes of 1911 and 1912 will take Horticulture 4, and Botany 24, instead of Horticulture 3.

EIGHTH SEMESTER.

				Required Semester Hours	
Choice	Farm Crops 15,	Thesis 5		3	or 5
	Farm Crops 16,	Thesis 5			
	Soils 11,	Thesis 3			
	Soils 12,	Thesis 3			
	Botany 5,	Vegetable Pathology		3	3
Choice	*Farm Crops 20,	Seminar	½	½	½
	*Soils 18,	Seminar	½		
	*A continuation of the work in the fifth semester. Standing will be for seventh and eighth semester. One hour credit for both semesters' work will be recorded at end of eighth semester.			— 6½ to	— 8½
	Electives will be selected from the list on page 134,			9½ to	13½
		Total semester hours		16	20

Farm Crops Department.

HAROLD DE MOTT HUGHES, PROFESSOR.

HARRY BRAINE POTTER, ASSISTANT PROFESSOR.

GEORGE LIVINGSTONE, INSTRUCTOR.

H. V. CALDWELL, EXTENSION WORK.

The added facilities of their admirable quarters on the fourth floor of the Hall of Agriculture enable the Farm Crops Department to offer work in accord with the demands of the times. Commodious and well lighted class-rooms, with new and well equipped research laboratories, offer the best of facilities for lecture and laboratory work.

The general elementary work in cereal study is conducted in the grain laboratory on the second floor of the new stock and grain judging pavilion. The higher and more scientific study of crops is pursued in the new and well equipped corn and small grain laboratories on the fourth floor of the Hall of Agriculture. Research laboratories, equipped with chemical and general apparatus used in biological research, offer special opportunities for investigation to graduate students.

The increased demand for competent farm managers has far outrun the supply. The demand is increasing for trained men in farm crops, to fill positions as teachers of agriculture in secondary schools, assistants in seed houses, and assistants on the editorial staffs of agricultural journals. The number of men well trained in farm crops, who are putting in operation on the farm the principles and practices studied in college, is annually increasing. Many men who have taken special training in farm crops production and breeding, have returned to their farms, where they are making a profitable specialty of raising pure-bred corn or small grain.

Short Courses in Corn and Small Grain, January 2 to January 14, 1911, a winter course in corn and small grain study of two weeks' duration, has been established to meet the growing demands of the men who cannot possibly attend the regular courses in agriculture. In this course a careful study of the corn plant is made. A close study of the ear, according to the score card, reveals the essential points of ideal seed corn. The importance of testing seed corn is emphasized, and practice in germination box use is given. The characteristics of the important varieties of corn grown in Iowa, their adaptability to the market demands, and prevailing climatic and soil conditions are noted. Special training is given those desiring to fit themselves for corn and small grain judges at fairs, etc. Corn judging certificates are issued to those who pass the required examination conducted by the Iowa Corn Growers' Association; likewise small grain judging certificates are issued by the Iowa Small Grain Growers' Association to those attaining the required standard of proficiency in small grain study. For those students who have attended two short courses, an advanced course of study is offered, In this course special study is made of corn and of small grains. The principles of grain breeding are studied, and the methods employed by prominent farmers who are making a specialty of grain breeding are investigated.

To assist in covering added expenses of such a course the following fees are charged:

Residents of Iowa, $3.00 for entire course.

Non-residents, $5.00 for entire course.

This fee covers the cost of instruction in farm crops and live stock, or in farm crops and horticulture. The arrangement of the study course permits the student to spend equal time in farm crops and live stock studies, or in farm crops and horticulture.

METEOROLOGY AND CLIMATOLOGY.

The object of this course is to give the student a knowledge of the fundamental principles which govern weather and climate. The first half of the semester is devoted to a study of the elementary principles of meteorology. The student is acquainted with the instruments used by the weather bureau; the principles upon which they are based and their care and uses are explained. The last half of the semester is given to a consideration of the fundamental principles which control weather and climate. Throughout the entire course the charts and maps issued by the state and federal weather bureaus are used freely. The student is given practice on the construction and interpretation of charts, and in forecasting. Elective in all Agricultural Courses. See descriptive course under Geology.

COURSES IN FARM CROPS.

1. **Corn Growing and Judging.** Through lecture and recitation the class receives its instruction in the principles and requirements of the growth of the corn plant, methods of selecting, storing, testing, grading, planting, cultivating and harvesting. The cost of production and use of the crop are taken up in detail, and the requirements of the commercial marketing of corn are studied. Each division of this subject is studied from first hand knowledge, students being required to make excursions of observation to farms, factories, and markets. A part of the semester is spent in studying corn in the field with reference to per cent stand, barren stalks and suckers; leaf surface is measured and computed, and correlation of the parts of the stalk is made. Each student is required to make a record of his own plot, husk it, and select the seed ears and hang them up for storage and shrinkage test. A detailed study is made of the botanical structure of the cornstalk, ear, and kernel according to a definitely outlined syllabus. Each student makes a germination box and carries on a test. The corn judging is limited entirely to score card practice, the student being urged to use a sample of home-grown corn. Two and two-thirds hours' credit. Recitations, two hours, and laboratory, two hours, per week. Fee, $1.50.

2. **Small Grains.** Includes the study of the following small grains: Oats, wheat (winter and spring), barley, rye, emmer and speltz, and macaroni wheat; their adaptation to soil and climate, preparation of seed bed, methods of seeding, botanical structure, problems of germination and plant growth; also score card practice in small grains. Two and two-thirds hours' credit. Recitations, two hours, and laboratory, two hours, per week. Fee, $1.50.

3. **Corn Breeding and Judging.** In this course a study is made of the origin of corn and its development. The characteristics of the leading varieties of corn are studied, and the adaptation of these varieties to the varying soil and climatic conditions of the state and country is made a special study. Principles of improvement and breeding are investigated. The breeding blocks in the station fields are visited and a special study of the variations and correlation of characters in the strains of corn being isolated, is made. The methods employed in the breeding of corn by other experiment stations and by prominent commercial corn breeders are studied. Corn judging is made a special feature in this course. Prerequisite, Farm Crops 1.

Two hours' credit. Lecture, one hour, and laboratory, three hours, per week. Fee, $2.00.

4. **Grain Breeding and Judging.** In this course is presented a detailed study of important varieties of small grains produced in the state. The study of their origin and adaptability to the differing climatic and soil conditions of the location in which they are grown is made a special feature of study. The history of grain breeding and the development and nature of the experiment station methods, along with the principles of plant breeding underlying these methods, are investigated. Farm practices in the improvement of the small grain crops, especially those employed by some of the prominent farmers making a special feature of this farm enterprise, are studied. Grain judging forms an important part of this work, emphasizing the classification of the several types and varieties of small grain. The essential differences of the different classes and their desirable qualities are studied. The commercial grading of grains and the detection of grain impurities, such as weed seeds, etc., are emphasized. The uses for which the small grains are grown and the method of manufacture of products from this raw material are presented. Two hours' credit. Lecture, one hour, and laboratory, three hours, per week. Fee, $2.00.

8. **Farm Management.** This course includes the study of the principles underlying farm management. Typical illustrations of the differing phases of specialized farming and of general farming are studied; problems of labor, fencing and marketing are considered, and methods employed by successful farmers are presented. A practical and thorough study of a system of farm accounts is a special feature of this course. Actual field study of the laying out and conducting of farms is made, and special exercises in planning of rotations, field locations, and placing of buildings, form an important part of this course. Three hours' credit. Three lectures per week. Fee, $2.00.

9. **Research in Farm Crops.** Individual investigation of special problems relating to cereal, forage, and root crops. Experiments are conducted in both field and greenhouse. Investigations are made as to the effect of differing conditions of storage on vitality of seed, and the effect of different stages of maturity on vitality of seed of the different crops. Variations in physical structure of crops and investigation of reasons for, and importance of such variations; methods of reproduction of the several crops and also circumstances influencing the reproduction of these crops, are investigated. Prerequisite, Farm Crops 1 and 2. Two hours' credit. Laboratory, six hours per week. Fee, $2.00.

10. **Advanced Research in Farm Crops.** This course offers opportunity for more advanced research into the problems of breeding of farm crops. A wider investigation of the principles of breeding may be made. Students with sufficient knowledge of chemistry may pursue the following lines of investigation: The causes of variation,

and the differences of chemical composition of the different varieties of cereals and forage crops, when these are subjected to differing conditions of soil and climate; the effect on the chemical composition of cereals of storing these under varying conditions of temperature and humidity. The effect on chemical composition of harvesting cereals at different stages of maturity, also forms an important phase of investigation in this course. The new and well equipped Farm Crops chemical laboratory furnishes special opportunity for investigation leading up to thesis work. Prerequisite, Farm Crops 9. Two hours' credit. Laboratory, six hours per week. Fee, $5.00.

11. **Advanced Study of Corn.** This course presents a deeper study of the principles underlying the breeding of corn. It aims at putting the student in possession of the latest scientific knowledge of corn breeding. Advanced corn judging in this course fits the students for expert judges at fairs and expositions, and for specialists in corn production. A more thorough study of the leading varieties of corn growing in the state is made. Prerequisite, Farm Crops 3. Two hours' credit. Laboratory, six hours per week. Fee, $3.00.

12. **Advanced Study of Small Grains.** A special study of the principles of plant breeding, as they are revealed by the breeding of small grains, is made. The evolution of plant breeding is studied. Special attention is given to experiment station methods and accomplishments in this line of work. The object of the course is to put the student in possession of the scientific facts and principles underlying this work, as well as to give him a working knowledge of scientific methods for the pursuit of such investigation. Grain judging is a special feature of this course. It is intended to fit the student for expert judging at fairs and expositions, and also to give him practical knowledge of grain, which he may use in the position of small grain specialist at grain centers. Adequate attention will be paid to the application of rules and regulations in commercial grading in operation at the several important grading centers. Prerequisite, Farm Crops 4. One and one-third hours' credit. Laboratory, four hours per week. Fee, $3.00.

15. **Thesis.** This investigation must be pursued upon some subject requiring original work. Three hours' credit.

16. **Thesis.** Same as above, excepting that it is five hours' credit.

17. **Grasses, Forage and Fiber Crops.** In this course an exhaustive study will be made of the several grasses grown in the corn belt. This study will include an investigation into their composition, habits of growth, adaptability to various types of soils and climatic conditions, and methods of seeding and handling. Such forage and fiber crops as have been grown in Iowa, and others that could be profitably introduced, will be given study similar to the above. Special attention will be given to the growth and breeding of alfalfa and timothy. Two hours' credit. Lecture, one hour. Laboratory, three hours per week Fee, $2.00.

18. **Summer Course in Farm Crops.** A study of small grains, grasses and clovers; habits of early growth, structure, rate of growth, reproduction, variations, correlations, effects of different methods of planting. Also Experiment Station Methods, nature of an ideal experimental field, maintaining fertility on such a field, layout of test plots, desirable area of plots, variety testing, crop handling, record keeping and interpretation, cereal breeding, planting methods, note-taking, selection, hybridization, increasing and distributing valuable strains produced, and experimental methods adopted by leading experiment stations. Five hours' credit. Laboratory, three consecutive weeks, beginning immediately after commencement. Fee, $5.00.

19. **Farm Crops Seminar.** The Juniors and Seniors in Farm Crops and Soils hold a joint seminar once each two weeks while college is in session. At each meeting papers prepared by students are presented and topics of special interest to Agronomy students are discussed. One hour credit.

20. **Farm Crops Seminar.** Continuation of Course 19. One hour credit.

Department of Soils.

WILLIAM HENRY STEVENSON, PROFESSOR.

JOSEPH F. BARKER, ASSISTANT PROFESSOR.

IRA G. MC BETH, ASSISTANT PROFESSOR OF SOIL BACTERIOLOGY.

ROY E. SMITH, ASSISTANT.

A. H. SNYDER, EXTENSION WORK.

A knowledge of the fundamental principles which underlie all successful systems of soil management should be the possession of every farmer. Without this knowledge he cannot produce maximum crops nor successfully maintain the fertility of his soil. And yet no greater obligation rests upon the American farmer than the conservation of our greatest natural resource, namely, the productive power of the land. It is the aim of the Soils Department to teach in a logical way the important principles concerning physical, plant food, and bacteriological soil factors. In order that this work may be carried on successfully, several courses are offered to undergraduate and graduate students, including courses in Soil Physics, Soil Fertility and Soil Bacteriology.

On the first floor of Agricultural Hall, five commodious and well appointed soils laboratories have been thoroughly equipped for accurate and scientific work. Apparatus of the latest design has been installed in these laboratories, thus affording excellent facilities for regular, advanced, and graduate students in Soils. In addition to these excellent laboratory facilities, suitable greenhouses and field plots are available for certain lines of study and experimentation. The Department is also equipped with photographs, charts, and maps which are used in the lecture room and laboratory. Valuable and abundant data, which have been secured by the Soils Section from extensive soil experiments, prove very helpful to students who are specially interested in the problems relating directly to the soils of Iowa.

The work of the department is twofold; first, to fit young men to successfully solve the soil problems which are an integral part of every farmer's experience; secondly, to fit some students to creditably fill positions in Agricultural colleges and Experiment stations and in other institutions in which the subject of Soils is taught. There is a constantly increasing demand for men well trained in Soils.

COURSES IN SOILS.

1. **Soil Physics.** This course comprises a study of the origin, formation and classification of soils; soil moisture and methods of conserving it; the principles which underlie dry farming; soil temperature, and conditions influencing it; soil texture as affecting heat, moisture and plant food; surface tension, capillarity, osmosis, and diffusion as affecting soil conditions; the effect upon the soil and the crop of plowing, harrowing, cultivating, cropping, and rolling; washing of soils and methods of preventing the same; preparation of seed beds; cultivation and drainage as affecting moisture, temperature, root development and the supply of available plant food. The work also comprises the determination of the specific gravity, apparent specific gravity, volume weight, porosity, water-holding capacity, and capillary power of various soils; also a study of the effect of mulches on the evaporation of water from the soil and the physical effects upon the soil of different systems of rotation and of continuous cropping. Prerequisite, Physics 205. Four hours' credit. Lectures and recitations, three hours, and laboratory, three hours, per week. Fee, $3.00.

2. **Soil Fertility.** This course comprises maintenance of fertility, fertilizers and rotations; the influence of commercial fertilizers, barnyard manure, and green manure upon the quality and yield of various crops; the effect of different crops upon the fertility of the soil and upon succeeding crops; different systems of rotation and the effect upon the productiveness of the soil of various methods of soil management; also a study of the storing, preserving, and application of farmyard manure. This work is supplemented by a study of manures, fertilizers and soils; their composition and agricultural value. Pot and field experiments are conducted to show the influence of fertilizers, applied to the soil in different quantities and at different times, upon the quality and yield of various crops. Special attention is given to leguminous crops as fertilizers and their place in crop rotation. A study is made of

special types of soil which are found in different sections of the state, such as clay, gumbo, loess, and peat, with special reference to the best methods of handling and cropping these soils. Prerequisites, Soils 1, and Chemistry 25. Four hours' credit. Lectures and recitations, three hours, and laboratory, three hours, per week. Fee, $5.00.

3. **Research Work in Soil Physics.** Experimentation and study of special problems relating to the physical characteristics of soils and their relation to crop production. Experiments may be carried on in the laboratory, greenhouse, or field. Modern laboratory and greenhouse facilities offer to the student an excellent opportunity for research work from the standpoint of Soil Physics. A wide range of special subjects is afforded the student. This course offers special advantages for a study of the physical composition of soils. Prerequisite, Soils 1. Two hours' credit. Laboratory, six hours per week. Fee, $2.00.

4. **Research Work in Soil Fertility.** Experimentation and study of special problems relating to maintaining and increasing the productive capacity of soils. This course is designed to enable the student to study one or more types of soil in which he may be specially interested, and also to study the effect of certain systems of soil management upon the plant food content and productive capacity of soils. This course offers special advantages for pot culture investigations and for a study of the chemical composition of soils. Prerequisites, Soils 1 and 2. Two hours' credit. Laboratory, six hours per week. Fee, $2.00.

6. **Advanced Soil Fertility.** This course includes a study of the plant food content and productiveness of particular types or classes of soils; the relation of the plant and soil, such as the influence of acidity and alkalinity, and also the influence of root excretions and of organic materials; the effect of fertilizing materials upon the growth, yield and quality of various crops as determined by pot culture and field experiments; methods of conducting fertility investigations and presenting data. Lectures will be given and the students will make a careful study of the fertility investigations which have been made by the Experiment Stations of this and other countries. Special emphasis will be placed upon the data from these investigations which tend to establish practical systems of soil management. This course is also intended for the student who desires to study the methods of experimentation which are employed by leading investigators along soil fertility lines. Prerequisites, Soils, 1 and 2. Two hours' credit. Lectures and recitations, two hours per week. Fee, $1.00.

7. **Investigation of Special Soils.** This work includes a study of the soil investigations which have been made at the Rothamsted Experiment Station with special reference to the effect of different systems of soil management upon the productive capacity of the soil. This course affords the student an opportunity to study and discuss the great mass of data which has been collected during a period of

more than half a century at the most famous experiment station in the world. Prerequisites, Soils, 1 and 2. One hour credit. Lectures and recitations, one hour per week. Fee, $1.00.

8. **Soil Bacteriology.** A study of the bacterial flora of some of the principal soil types of the state, including the determination of the number and distribution of bacteria in the soil, their isolation, and a study of the morphological, physiological and cultural characteristics of some of the more important species. The work also comprises a study of the decomposition of nitrogenous and carbonaceous matter, nitrification, denitrification, the assimilation of free atmospheric nitrogen, and methods for testing the nitrifying, denitrifying and nitrogen fixing properties of soils. The course is intended to cover the interrelationships existing between bacteria and the soil, and thus indirectly between bacteria and the growth of higher plants. Prerequisites, organic chemistry and general bacteriology. Three hours' credit. Lecture, one hour, and laboratory, six hours, per week. Fee, $4.00.

11. **Thesis.** Must be upon some subject requiring original investigation in Soils. Three hours' credit.

12. **Thesis.** Same as Soils 11, except that it is five hours' credit.

13. **Soil Surveying and Mapping.** This course includes a further study of the physical properties of Soils and their physical composition as determined by mechanical analysis. The preparation of large scale plane table maps of selected areas and a detailed survey of the soils. Also a study of the relation of topography and the physical and chemical composition of soils to the character and growth of the native vegetation. The principles underlying the adaptability of particular soils to different kinds of forest and fruit trees, and to various farm and garden crops. Prerequisite, Soils 1. One and two-thirds hours' credit. Lectures and recitations, one hour, and laboratory, two hours, per week. Fee, $2.00.

14. **Advanced Soil Bacteriology.** A continuation of the work given in Soils 8 and the consideration of some additional problems, includin a study of the transformation of the mineral constituents of the soil soil inoculation, cellulose fermentation, effect of cultural conditions on the bacterial flora of the soil, and bacteria in barnyard manures with special reference to the conservation of the manurial constituents. Prerequisite, Soils 8. Three hours' credit. Lecture or reports on assigned reading, one hour, and laboratory, six hours, per week. Fee, $4.00.

15. **Advanced Laboratory Work in Soil Physics.** A study of the physical composition of soils by mechanical analysis and petrological examination; the determination of the temperature, moisture, and soluble salt content of various soils under field conditions, including methods of testing for alkali soils. Greenhouse, laboratory and field experiments are conducted to determine the effect upon soil conditions

of different methods of soil management; the work also includes assigned readings, study of results of previous investigations, and written reports of results of experiments and investigations made by the student. Prerequisite, Soils 1. Two hours' credit. Laboratory, six hours per week. Fee, $2.00.

16. **Advanced Laboratory Work in Soil Fertility.** A detailed study of the chemical composition of soils, the analysis of typical soils of the state, or any particular locality, with special reference to the determination of humus, nitrogen, phosphorus, potassium and lime. Physiological soil analysis by the parrafin wire basket method and larger pot cultures, and by the growing of plants in aqueous extracts of soils. The work also includes assigned readings, study of results of previous investigations, and written reports of results of experiments and investigations made by the student. Prerequisite, Soils 2. Two hours' credit. Laboratory, six hours per week. Fee, $2.00.

17. **Soils Seminar.** One hour credit. The Juniors and Seniors in Soils and Farm Crops hold a joint seminar each two weeks while college is in session. At each meeting papers, prepared by students, are presented and topics of special interest to Agronomy students are discussed.

18. **Soils Seminar.** A continuation of Course 17. One hour credit.

Department of Dairying

MARTIN MORTENSEN, ASSOCIATE PROFESSOR.

GILBERT T. GUTHRIE, ASSISTANT PROFESSOR.

JOHN HAROLD GORDON, ASSISTANT PROFESSOR IN DAIRY BACTERIOLOGY.

FRANK LEWIS ODELL, INSTRUCTOR.

ADDISON HERBERT CHADSEY, INSTRUCTOR.

E. S. ESTEL, STUDENT ASSISTANT.

HAROLD FREDERICK LUICK, EXTENSION WORK.

CHARLES C. R. BUSH, EXTENSION WORK.

Owing to the rapid progress and the application of scientific principles to the dairy industry, it is necessary that those engaged in this work should keep in touch with new ideas and principles. In order to meet this demand, the dairy department offers, first, a four-year course for qualifying students to become competent teachers and investigators of dairying in agricultural colleges and experiment stations, inspectors of dairy products and creameries in municipal, state and government service, or superintendents of large creameries or dairy farms; second, one-year course, for fitting students for becoming operators of creameries, cheese factories, and dairy farms; third, a two-weeks' short course, for acquainting experienced dairy and creamery men with new methods and investigations which they cannot learn in their own factories; and fourth, a one-week's course for creamery managers and secretaries.

The Dairy Department offers unexcelled facilities for teaching dairying in a thoroughly practical and scientific manner. The dairy farm of 200 acres is well stocked with various types and breeds of milk cows. The milk from this herd, together with the milk and cream shipped and hauled to the college, supplies all the needs of the creamery.

The Dairy Building erected at a cost of about $75,000 is a practical working creamery, and cheese and ice-cream factory, and is considered by authorities to be one of the most practical and complete dairy buildings in existence.

COURSE IN DAIRYING.

For Freshman year, see Agricultural Course, page 77.

Sophomore Year.

THIRD SEMESTER.

		Required Semester Hours.
Agricultural Engineering 7,	Dairy Engineering	1⅔
Animal Husbandry 3,	Breed Types of Cattle and Sheep	3⅓
Horticulture 3,	Orcharding	2⅔
Agricultural Chemistry 21,	Elementary Experimental Chemistry	5
English 12,	Argumentation	2
Economic Science 9,	Outlines of Economics	3
Public Speaking 10,	Extempore Speech	2
Military 3, or Athletics		—
	Total semester hours	19⅔

FOURTH SEMESTER.

		Required Semester Hours.
Dairying 11,	Cheese Making	3
Dairying 13,	Milk Testing and Milk Inspection	1⅔
Animal Husbandry 4,	Breed Types of Dairy Cattle, Horses and Swine	3⅓
Agricultural Chemistry 23,	Elementary Experimental Chemistry	5
Choice: Economic Science 10, History 6,	Agricultural Economics 3 French Revolution and XIX Century 3	3

Public Speaking 11,	Extempore Speech	2
Military 4, or Athletics		
	Total semester hours	18

Junior Year.

FIFTH SEMESTER.

		Required Semester Hours.
Dairying 14,	Advanced Butter Making	3⅓
Animal Husbandry 21,	Principles of Breeding	2
Agricultural Chemistry 25,	Agricultural Analysis	4
Botany 25,	Microscopical Examination of Foods	2
Dairying 26,	Judging Dairy Products	1
		12⅓
Electives will be selected from list on page 134.		3⅔ to 7⅔
	Total semester hours	16 to 20

SIXTH SEMESTER.

		Required Semester Hours.
Dairying 16,	Technology of Milk	1
Dairying 24,	Fancy Cheese Making	2⅓
Bacteriology 1,	General Bacteriology	4
Agricultural Chemistry 26,	Agricultural Analysis	4
Dairying 27,	Butter Judging	1
		12⅓
Electives will be selected from list on page 134.		3⅔ to 7⅔
	Total semester hours	16 to 20

Senior Year.

SEVENTH SEMESTER.

		Required Semester Hours.
Dairying 17,	Dairy Bacteriology	4
Dairying 19,	Seminar Work	2
Agricultural Chemistry 40,	Dairy Chemistry	4
Animal Husbandry 20,	Animal Feeding	2
Veterinary 44,	Sanitary Science	2
Dairying 28,	Advanced Butter Judging	1
		15
Electives will be selected from list on page 134.		1 to 5
	Total semester hours	16 to 20

EIGHTH SEMESTER.

		Required Semester Hours.
Dairying 20,	Factory Management	3⅓
Dairying 21,	Preparation of Ice-Cream and Ices	1⅔
Dairy 23,	Thesis	2
Animal Husbandry 15,	Milk Production	1
		8
Electives will be selected from list on page 134.		8 to 12
	Total semester hours	16 to 20

ONE-YEAR COURSE IN DAIRYING.

The one-year course in dairying is designed to meet the needs of those who want to acquire a knowledge of practical dairy methods. This course includes one college year beginning in August and ending in June. Students completing this course will be given certificates when evidence is furnished that they have successfully for one year operated a creamery or other dairy establishment.

FIRST SEMESTER.

Dairying 1,	Dairy Practice	6
Dairying 2,	Buttermaking	1
Dairying 3,	Milk Testing	1
Agricultural Engineering 7,	Dairy Engineering	1⅔
Animal Husbandry 19,	Feeding Dairy Stock	2
Chemistry 28,	Dairy Chemistry	1
Dairying 6,	Dairy Bacteriology	1
	Total semester hours	13⅔

SECOND SEMESTER.

Dairying 26,	Judging Dairy Products	1
Dairying 1,	Dairy Practice	6
Dairying 8,	Cheese Making	1
Dairying 5,	Bookkeeping	1
Dairying 20,	Factory Management	3⅓
Animal Husbandry 18,	Breeding and Judging Dairy Stock	2
Dairying 21,	Preparation of Ice Cream and Ices	1⅔
Chemistry 29,	Dairy Chemistry	2
	Total semester hours	18

COURSES IN DAIRYING.

1. **Dairy Practice.** Includes practical work in buttermaking, cheesemaking, ice-cream making, and care of the boiler and ice machine. Five to seven hours' laboratory work per day. Six hours' credit.

2. **Buttermaking.** Includes a study of the composition of milk and dairy products, the principles of gravity and centrifugal separation of cream, cream ripening, preparation of starters, churning, and preparation of butter for market. One hour credit.

3. **Milk Testing.** A study of the Babcock test, and of the Farrington and Manns' test for determining acidity, the use of the lactometer for detecting adulterations, and also the composite sampling and testing of individual cows. One hour credit.

5. **Bookkeeping.** Study of the best form of bookkeeping for the factory business. One hour credit.

6. **Dairy Bacteriology.** Application of the principles of bacteriology in the care of milk, and in butter and cheesemaking. One lecture per week.

8. **Cheesemaking.** Includes a study of the principles and practices involved in the manufacture of Cheddar cheese. One hour credit.

For courses one, two, three and eight, all of which are offered in the one year Dairy Course, a fee of $10.00 per semester is charged.

10. **Domestic Dairying.** Study of those dairy subjects that interest the housekeeper and dietetist. The important topics are: The nutritive and economic value of milk; its dietetics and hygiene; market milk, infants' milk, invalids' milk, cream, ice cream, condensed milk, milk chocolates, malted milk, dried milk, fermented milks (Kephir, Koumissete), buttermilk, butter, and cheese. Demonstrations are given in types of butter and cheese and in testing the purity of milk and butter. Two lectures per week. Fee, $2.00.

11. **Cheesemaking.** A study of the importance of the quality and composition of milk in the manufacture of Cheddar cheese; the principles involved in cutting, heating, milling, salting and pressing the curd, curing and marketing; influence of organized and unorganized ferments in cheese; and the construction and ventilation of cheese curing rooms. Three hours' credit. Recitation, one hour and laboratory, six hours, per week. Fee, $3.00.

12. **Farm Dairying.** Includes a general study of the secretion, composition, testing, separation and acidity of milk, preparation of starters, ripening of cream, and churning and packing butter. Two and two-thirds hours' credit. Recitation, two hours, and laboratory two hours, per week. Fee, $3.00.

13. **Milk Testing and Milk Inspection.** A study of the Babcock test, Farrington's and Manns' test for determining acidity, the use of

the lactometer for detecting adulteration, composite sampling, and testing of individual cows, and detection of different preservatives and adulterations. One and two-thirds hours' credit. Recitation, one hour, and laboratory, two hours, per week. Fee, $2.50.

14. **Advanced Buttermaking.** A study of the physical and chemical properties, secretion and composition; separation of milk, cream ripening, the principles of churning, packing and marketing butter. Prerequisite, Agricultural Chemistry 21. Three and one-third hours' credit. Recitations, two hours, and laboratory, four hours, per week. Fee, $3.00.

16. **Technology of Milk.** A study of the utilization of milk and its products, as the preparation of condensed, modified, and milk sugar, casein, and the food value of milk and its products. Prerequisite, Agricultural Chemistry 25. Recitation, one hour per week. Fee, 50 cents.

17. **Dairy Bacteriology.** A study of bacteria in milk and its products; their sources, mode of entry and subsequent changes produced; the production and handling of milk from a hygienic and economic view-point and its relation to the public health. Prerequisites, Bacteriology 1, and Chemistry 26. Four hours' credit. Lectures, two hours, and laboratory, six hours, per week. Fee, $4.00.

19. **Seminar Work.** A study of various authorities on Dairying together with the work of the experiment stations on this subject. Prerequisites, Bacteriology 1, Dairying 11 and 14. A knowledge of French and German is recommended. Two hours per week.

20. **Factory Management.** Consists of the location, organization, construction, drainage, and ventilation of factories, the treatment of the by-products, and creamery refrigeration, thus qualifying a student to superintend or manage a large factory or dairy establishment. It is advisable for students to put in the laboratory during vacation or when work can be done during consecutive days. Prerequisite, Dairy 14 and 28. Three and one-third hours' credit. Lecture, two hours, and laboratory, four hours, per week.

21. **Preparation of Ice-Cream and Ices.** A study of the preparation of ice-cream, sherbets, and ices, made on a private or commercial scale. Both lectures and laboratory. One and two-thirds hours' credit. One recitation and one two hour laboratory. Fee, $3.00.

23. **Thesis.** Original work on some dairy subject. May be worked out in co-operation with the departments of chemistry or bacteriology. Students should consult the professor concerning their subject at the beginning of their Senior year. Two hours per week.

24. **Fancy Cheesemaking.** Includes making the varieties found in the American market as Limburger, Swiss, Brick, Roquefort, Sage, Stilton, Pineapple, Gouda, Gorgonzola, and Neufchâtel. Two and one-third hours' credit. Lecture, one hour, and laboratory, four hours, per week. Fee, $3.00.

25. **Advanced Dairy Bacteriology.** Laboratory investigation of bacteriological problems relating to dairying, the nature of the work being adapted largely to the individual student. Prerequisite, Dairy 17. Credit, three hours.

26. **Judging Dairy Products.** Includes the judging of butter, milk and cream, ice-cream, sherbet, and the various kinds of cheeses, paying special attention to score cards. Prerequisite, Dairying 13. One hour credit. Fee, $3.00.

27. **Butter Judging.** A study of standard market requirements. Includes more advanced work in scoring butter. Prerequisites, Dairying 14 and 26. One hour credit. Fee, $3.00.

28. **Advanced Butter Judging.** This course is intended to qualify a student to fill the position of an official judge. One hour credit. Fee, $3.00.

Department of Animal Husbandry

WILLARD JOHN KENNEDY, PROFESSOR.

WAYNE DINSMORE, ASSOCIATE PROFESSOR.

HOWARD CASTNER PIERCE, ASSISTANT PROFESSOR, POULTRY.

EDWARD NORRIS WENTWORTH, ASSISTANT PROFESSOR.

WILLIAM HARPER PEW, ASSISTANT PROFESSOR.

ARCHIBALD LEITCH, ASSISTANT PROFESSOR, SUPT. OF DAIRY FARM.

WILLIAM A. LIPPINCOTT, STUDENT ASSISTANT, POULTRY.

B. F. MILLER, GRADUATE ASSISTANT.

RALPH K. BLISS, EXTENSION WORK.

HAROLD FREDERICK LUICK, EXTENSION WORK.

CHARLES C. R. BUSH, EXTENSION WORK.

LESLIE EUGENE TROEGER, EXTENSION WORK.

The department of Animal Husbandry stands for all lines of work which pertain to the judging, selecting, breeding, feeding, development, care, and management of the various breeds and classes of domesticated animals. Because of the importance of the live stock industry to the welfare of the state, and because of the demand for instruction in this line, the equipment for instruction has been made as complete in every detail as possible.

The herds and flocks, established at an early date, have been added to from time to time until our equipment in this line, consisting of almost all recognized breeds of animals, places us in a position to do work in Animal Husbandry lines which cannot be accomplished in those institutions where such specimens are not furnished for instruction. Believing that training the eye is the only way to make a young man a proficient judge of live stock, the work of the lecture room and laboratory is demonstrated by the use of living specimens.

The two commodious judging pavilions, located near the barn, afford ample room for dividing the classes into many sections, thus allowing individual work.

An excellent collection of horses representing all the market classes and the breeds of both light and heavy types is maintained for instruction purposes. Among these are good representatives of the Shires, Percherons, Clydesdales, French Coachers, Hackneys, Standard breds, and American Saddle Horses. Some of the horses are imported; while the others have been purchased, with much care in their selection, from the best breeders on the continent.

More than 200 head of cattle, representing all the leading beef, dual-purpose, and dairy breeds are maintained on the farm. Complete breeding herds of most of the breeds are kept. An excellent collection of steers, representing the highest type of fat steer, and all the other classes and grades to be found in our leading markets down to the very lowest grades, is always available for class work. This affords our students an excellent opportunity to study the market demands and to know what constitutes each class, also why there is such a wide margin in the prices paid for cattle by the packer.

The dairy farm is well stocked with dairy cattle, including a herd of about a hundred representatives of the Holsteins, Jerseys, Guernseys, Ayrshires, milking Short-horns, with good sires of the different breeds. This equipment affords an excellent opportunity for class work when studying the origin, history, and development of the diferent breeds of dairy cattle, their characteristics and the conditions nder which they are evolved; also for carrying on investigations along he lines of breeding, feeding and management of the dairy herd for rofit; and the relative values of home-grown feedstuffs and byroducts in the production of milk and butter fat.

The flock of sheep, consisting of over 200 head of seven different reeds, have been carefully selected to represent the type and characrtistic of each breed, both in regard to form and wool-bearing qualies. In addition to the breeding flocks, the department has a choice ollection of fat wethers which affords an opportunity for the student familiarize himself with the highest type of finished mutton sheep. l these are available for class work.

In the swine department, representatives of six breeds of the best nerican and British varieties are maintained. As in the other dertments, the aim in this has been to keep in touch with the modern eas of leading breeders, both in regard to breeding and the type of e animals in these breeds.

At all seasons of the year there is more or less feeding of market stock being done on the farm and in connection with the Experiment Station, so that excellent material is always available for instruction purposes regarding the qualities that add to the value of stock for the ordinary market. Having pure-bred representatives, it is easy to inform the student in a practical way on the finer points of color, type, and other characteristics that relate to the pure-bred classes of stock.

To assist further in this work, the herd books of the different American and foreign registry associations are being constantly added to the library. The College possesses the most complete set of the English Short-horn herd books in existence in America. Through herd book study, the student is enabled not only to inform himself in regard to pedigrees, but he is enabled also to study the different scales of points which the breeders have adopted to represent the highest types of the various breeds.

The department is also equipped with photographs, charts, and lantern slides which are used in the lecture room when it is impossible to illustrate with the living animal. The abundant material available from the herds and flocks is used extensively in all lectures and score card practice. By means of score cards prepared by the department, the students are brought in close contact with the animals, and through them are informed on the points of market merit desirable in ordinary stock, while later the use of the official scale of points for the different breeds in a similar way makes them skilful in judging representatives of different breeds.

As soon as the student is familiar with the use of the score card, comparative judging is introduced. In comparative judging from four to six animals are used, and each student is required to place all the animals in order of merit, and write down clearly and concisely on a blank folder, prepared especially for this work, full reasons for making his awards. This kind of work teaches the student to compare animals and to balance the weak and the strong points of each in making his final awards. As soon as the student demonstrates his ability to place classes well, herd groups and sweepstake classes are introduced during his Senior year's work. This kind of work is similar to the most difficult judging done at our leading state fairs and international expositions. As soon as the student shows that he possesses the qualifications needed to judge stock in the show ring, he is sent out, in answer to the many requests from the secretaries, to judge various classes of stock at county fairs. This, in connection with his college work, results in establishing the lessons learned in the class room.

Positions Open for Men Trained Along Animal Husbandry Lines.

There is a great demand for competent young men trained along the lines of practical and scientific Animal Husbandry work, men who combine their college training with practical experience and native ability. Such is the training offered to the young men in this course. The demand for such students is unlimited at a compensation not exceeded in any other calling. A few of the many lines of work open to graduates of this department are: College and experiment station work, agricultural journalism, managers of stock farms, salesmen with commission merchants, buyers for the packing houses at the many stockyard centers, and salesmen of animal feedstuffs manufactured by the packing houses, glucose companies, linseed and cottonseed oil companies.

Clay, Robinson & Co. Fellowship Prizes.

Clay, Robinson & Co., Live Stock Commission Merchants, Union Stock Yards, Chicago, offer annually $1,000.00 in prizes to be awarded to the Agricultural Colleges making the best exhibit of live stock at the International Live Stock Exposition held at Chicago in December of each year. They stipulate that the money won by the various colleges shall be used for the establishment of fellowship prizes to be awarded to graduate students in the department of Animal Husbandry. These fellowships, amounting to $250.00 per student annually, are granted by the Board of Trustees upon the recommendation of the dean of the Division of Agriculture and the head of the department. A student holding a fellowship may pursue graduate work in Animal Husbandry.

WINTER COURSE IN STOCK JUDGING.

(January 2, 1911, to January 14, 1911.)

In response to a widespread demand for special short course instruction in the judging and feeding of animals, a two weeks' course has been established during the winter vacation. This course will begin January 2, 1911, and continue for two weeks. It will be devoted exclusively to score card practice, and judging of horses, cattle, sheep, and hogs, and lectures on feeding the same.

In this work special attention will be given to the selection of animals best suited for feeding purposes. Good specimens of the highest type of fat steers and ideal representatives of all the various breeds will be used for class work. At the conclusion of the cattle work a slaughter test and block demonstration of the various market types of steers will be conducted under the supervision of John Gosling, Kansas City, Missouri. This course is intended especially for the man on the farm that cannot avail himself of the opportunity to take a complete course.

A special course in corn judging will be given at the same time and the work will be so arranged that all those present may take both lines of work.

To cover in part the expense of procuring additional help and tock for demonstration, a tuition fee of $3.00 for residents and $5.00

for non-residents will be charged for admission to this course, but one fee will cover the instruction in both grain and stock judging.

COURSE IN ANIMAL HUSBANDRY.

For Freshman year, see Agricultural Course, page 77.

Sophomore Year.

THIRD SEMESTER.

		Required Semester Hours.
Animal Husbandry 3,	Breed Types of Cattle and Sheep	3⅓
Agricultural Engineering 4,	Farm Engineering	3⅓
Zoology 2,	General Zoology	5
Agricultural Chemistry 21,	Elementary Experimental Chemistry	5
Horticulture 3,	Orcharding	2⅔
Military 3, or Athletics		
	Total semester hours	19⅓

FOURTH SEMESTER.

		Required Semester Hours.
Animal Husbandry 4,	Breed Types of Dairy Cattle, Horses and Swine	3⅓
Agricultural Engineering 5,	Farm Machinery and Farm Motors	2⅔
Zoology 3,	General Zoology	5
Agricultural Chemistry 23,	Elementary Experimental Chemistry	5
Botany 26,	Ecology	2
English 12,	Argumentation	2
Military 4, or Athletics.		
	Total semester hours	20

Junior Year.

FIFTH SEMESTER.

		Required Semester Hours.
Animal Husbandry 11,	Feeding and Management of Live Stock	2
Animal Husbandry 31,	Poultry Management	2⅔
Agricultural Chemistry 25,	Agricultural Analysis	4
Soils 1,	Soil Physics	4
Zoology 5,	Embryology	3
Veterinary 23,	Comparative Physiology	2
Animal Husbandry 22,	Seminar	½

This course must be continued through the year. Final standing will not be certified to recorder until the close of the sixth semester.

	18⅙
Electives will be selected from the list on page 134.	0 to 1⅚
Total semester hours	18⅙ to 20

SIXTH SEMESTER.

		Required Semester Hours.
Animal Husbandry 8,	Animal Breeding	2
Animal Husbandry 12,	Feeding and Management of Live Stock	2
Animal Husbandry 37,	Poultry Management	2⅔
Soils 2,	Soil Fertility	4
Zoology 8,	Animal Parasites	2
Agricultural Chemistry 26,	Agricultural Analysis	4
Animal Husbandry 22,	Seminar	½

A continuation of work in fifth semester. Standing will be for fifth and sixth semester. One hour credit for both semesters' work will be recorded at end of sixth semester.

	17⅙
Electives will be selected from the list on page 134.	0 to 2⅚
Total semester hours	17⅙ to 20

Senior Year.

SEVENTH SEMESTER.

		Required Semester Hours.
Animal Husbandry 6,	Advanced Live Stock Judging	1⅓
Animal Husbandry 9,	Animal Nutrition and Packing House By-Products	2
Veterinary 19,	Obstetrics	1
Veterinary 44,	Sanitary Science	2
Veterinary 55,	Anatomy of Domestic Animals	1⅓
Animal Husbandry 23,	Seminar	½

This course must be continued through the year. Final standing will not be certified to the recorder until close of the eighth semester.

	8⅙
Electives will be selected from the list on page 134.	7⅚ to 11⅚
Total semester hours	16 to 20

EIGHTH SEMESTER.

		Required Semester Hours.
nimal Husbandry 7,	Herd Book Study	2

Animal Husbandry 10,	Thesis	2
Animal Husbandry 13,	Advanced Work in Beef Production	1
Animal Husbandry 14,	Advanced Work in Pork Production	1
Animal Husbandry 15,	Milk Production	1
Animal Husbandry 16,	Advanced Work in Mutton and Wool Production	1
Animal Husbandry 17,	Advanced Work in Horse Feeding	1
Animal Husbandry 23,	Seminar A continuation of work in the seventh semester. Standing will be for seventh and eighth semesters. One hour credit for both semesters' work will be recorded at close of eighth semester.	½
Veterinary 16,	Horse Shoeing	2
Veterinary 18,	Conformation and Soundness	2
Zoology 6,	Evolution of Animals	1
		14½
Electives will be selected from the list on page 134.		1½ to 5½
	Total semester hours	16 to 20

COURSES IN ANIMAL HUSBANDRY.

1. **Market Types of Cattle and Sheep.** Includes the judging of different market classes of cattle, both beef and dual-purpose, and sheep, both mutton and wool. Credit, two hours. Three hours' laboratory and one hour lecture per week. Fee, $2.00.

2. **Market Types of Dairy Cattle, Horses and Swine.** Includes judging different market classes of dairy cattle, light and heavy horses, and swine, (bacon and fat). Three hours' laboratory and one hour lecture per week. Fee, $2.00.

3. **Breed Types of Cattle and Sheep.** Includes judging representatives of different breeds according to their official standards, a study of their origin, history, characteristics, and adaptability to different conditions of climate and soil. Prerequisite, Animal Husbandry 1. Three and one-third hours' credit. Lectures, two hours and two 2-hour judging periods per week. Fee, $2.00.

4. **Breed Types of Dairy Cattle, Horses and Swine.** Includes judging of representatives of different breeds according to their official standards, a study of their origin, history, characteristics, and adaptability to different conditions of climate and soil. Prerequisite Animal Husbandry 2. Three and one-third hours' credit. Lectures two hours, and two 2-hour judging periods per week. Fee, $2.00.

6. **Advanced Live Stock Judging.** Includes judging horses, cattle, sheep and swine, especially in groups similar to county and state fair work. Prerequisites, Animal Husbandry 4, and Zoology 3. One and one-third hours' credit. Two 2-hour judging periods per week. Fee, $2.00.

7. **Herd Book Study.** Includes a study of herd books, with a view to becoming acquainted with the pedigrees of the leading strains and families of the different breeds of live stock. Prerequisite, Animal Husbandry 4. Recitations, two hours per week.

8. **Animal Breeding.** Embraces a study of principles of breeding, including selection, heredity, atavism, variation, fecundity, with the presentation of methods of breeding, in-and-in breeding, cross breeding, etc., and a historical study of their results, also the several features relating to the higher breeding of pure-bred stock. Prerequisites, Animal Husbandry 4, and Zoology 5. Recitations, two hours per week.

9. **Animal Nutrition and Packing House By-Products.** Study of anatomy and physiology of the digestive system, the purpose of nutrition, the theory and practical economy of rations for growth, fattening, milk or maintenance; sanitation of feeds and hygiene of the farm. Prerequisite, Chemistry 25. Recitations, two hours per week.

10. **Thesis.** Must be along some line to be arranged with the head of the department. Two hours' credit.

11. **Feeding and Management of Live Stock.** The practical feeding, care, and management of beef and dairy cattle. Two hours' credit. Lecture, one and one-third hours, and laboratory, two hours, per week. Fee, $2.00.

12. **Feeding and Management of Live Stock.** The practical feeding, care and management of horses, hogs and sheep. Prerequisite, Animal Husbandry 11. Two hours' credit. Lecture, one and one-third hours, and laboratory, two hours, per week. Fee, $2.00.

13. **Advanced Work in Beef Production.** A systematic study of the most successful and economical methods of producing beef cattle or market purposes; production of baby beef; advisability of long and short feeding periods; and the feeding of grain rations to cattle on grass. Prerequisites, Animal Husbandry 9, and Zoology 8. One hour credit. Five 1-hour periods per week for first five weeks.

14. **Advanced Work in Pork Production.** A systematic study of most successful and economical methods of growing and finishing pigs of both the lard and bacon types for market purposes. Prerequisites, Animal Husbandry 9, and Zoology 8. One hour credit. Five 1-hour eriods per week for second five weeks.

✓ 15. **Milk Production.** Study of various feeding stuffs and the methods of preparing and feeding same as related to most successful and economical production of milk. Prerequisite, Animal Husbandry One hour credit. Five 1-hour periods during four weeks, following nimal Husbandry 14.

16. **Advanced Work in Mutton and Wool Production.** A thorough study of various feeding stuffs as related to economical production of mutton and wool. Prerequisites, Animal Husbandry 9 and Zoology 8 One hour credit. Five 1-hour periods per week following Animal Husbandry 15.

17. **Advanced Work in Horse Feeding.** A study of most successful and economical methods of growing and developing young animals; most economical and satisfactory rations for horses at light, medium and heavy work; study of the feeding stuffs best adapted to the production of heavy and economical gains on horses which are being fattened for market. Prerequisites, Animal Husbandry 9, and Zoology 8 One hour credit. Five 1-hour periods per week following Animal Husbandry 16.

18. **Breeding and Judging Dairy Stock.** Judging dairy stock with the score card and by comparative judging; also study of principles methods and practice of breeding dairy stock and their improvement Two hours' credit. Lecture, one hour, and laboratory, three hours, pe week.

19. **Feeding Dairy Stock.** Principles of feeding animals for th most economical production, with the composition and use of various feeding materials, feeding of dairy cows, including the influence o various feeding stuffs on the quantity, quality and composition of milk butter and cheese. Two lectures per week.

20. **Animal Feeding.** A study of the composition and digestibility of feeding stuffs; the preparation of coarse fodders; the grinding steaming and cooking of feeding stuffs; feeding standards and the calculation of rations; feeding for meat, milk, wool, growth and work Prerequisite, Chemistry 13 or 25. Two hours' credit.

21. **Principles of Breeding.** An elementary course in breedin offered to meet the demands of those students who have not sufficien foundation to take the regular course in Animal Breeding. Embrace a study of the general principles of breeding, selection, variation heredity, atavism, etc., and a historical study of the results to date Prerequisites, Animal Husbandry 1 and 2. Two hours' credit.

22. **Animal Husbandry Seminar.** One hour credit.

23. **Animal Husbandry Seminar.** One hour credit.

The Animal Husbandry Seminar Courses 22 and 23 meet once eacl two weeks while college is in session, and has for its members th professors and instructors in Animal Husbandry, and all students in th Junior and Senior classes in the course in Animal Husbandry. A each meeting, four students—two Seniors and two Juniors—presen papers on associated Animal Husbandry topics. These subjects ar selected a half year in advance and follow, in regular series, Animal Breeding, Relation of Animal Husbandry to Other Industries Animal Feeding, and a study of Live Stock Organizations, Expositions, College and Experiment Station Organization and Equipment

POULTRY HUSBANDRY.

The Poultry Husbandry Department affords opportunities for instruction in all lines of poultry work, such as the selection, care and management, incubating, brooding, judging, breeding, feeding, showing, marketing and diseases of various varieties of fowls, ducks, turkeys and geese.

The Poultry Farm of nearly twenty acres, upon which the buildings have been erected during the last two years, offers unexcelled opportunities for practical instruction. The buildings consist of a large headquarters building, long poultry house, and many colony houses for brooders, young stock, breeding stock, and fattening stock. The Headquarters Building contains a large feed room, carpenter shop, incubator room, killing and marketing room, egg room, and room for attendants; and is without doubt the best building of its kind in the country. The long poultry house, used in laboratory and investigation work, is of the cloth curtain type, and consists of seven 12x12 pens which, together with the colony houses, have a capacity of approximately 1,000 head of poultry. All pens are equipped with trap nests so that individual egg records may be obtained from each hen. The Incubator Room is equipped with machines made by several of the leading incubator firms and affords opportunity for a complete study of the different types of incubators. A thorough study of the atest brooding methods is also made.

POSITIONS OPEN TO MEN TRAINED ALONG POULTRY HUSBANDRY LINES.

At the present time there is an urgent and increasing demand for college men who possess scientific training in Poultry Husbandry, together with practical experience and ability. Some of the openings or students trained along these lines are government, college and experiment station work, managers of utility and fancy poultry farms, poultry journalism and poultry judging, managers of poultry supply houses and poultry fattening establishments, and salesmen with the ncubator and brooder manufacturers.

COURSE IN POULTRY HUSBANDRY.

Optional Senior year for Animal Husbandry students.

For Freshman year see Agricultural Course, page 77.

For Sophomore and Junior years see Animal Husbandry Course, page 100.

Senior Year.

SEVENTH SEMESTER.

		Required Semester Hours.
nimal Husbandry 9,	Animal Nutrition	2

Animal Husbandry 30,	Poultry Judging	2⅔
Animal Husbandry 32,	Practice in Poultry Feeding and Management	1
Animal Husbandry 35,	Poultry Research and Experimentation	1
Animal Husbandry 38,	Practice in Poultry Fattening	1
Animal Husbandry 41,	Anatomy and Physiology of Poultry	2
Animal Husbandry 40,	Poultry Seminar	½
Veterinary 44,	Sanitary Science	2
Bacteriology 1,	General Bacteriology	4
Agricultural Journalism 1,		1
		17⅙

Electives will be selected from the list on page 134, 0 to 2⅚

Total semester hours 17⅙ to 20

EIGHTH SEMESTER.

		Required Semester Hours.
Animal Husbandry 10,	Thesis	2
Animal Husbandry 33,	Incubator Practice	1
Animal Husbandry 34,	Brooder Practice	1
Animal Husbandry 36,	Poultry Research and Experimentation	1
Animal Husbandry 40,	Poultry Seminar	½
Animal Husbandry 39,	Advanced Poultry Judging	1
Animal Husbandry 42,	Marketing Poultry Products	2
Veterinary 18,	Conformation and Soundness	2
Economics 9,	Outlines of Economics	3
Zoology 6,	Evolution of Animals	1
Agricultural Journalism 2,		1
		15½

Electives will be selected from the list on page 134, ½ to 4½

Total semester hours 16 to 20

COURSES IN POULTRY HUSBANDRY.

30. **Poultry Judging.** This course includes a study of the origins, history, and classification of the various breeds and varieties; and the scoring, judging and breeding of the most important varieties, in accordance with the American Standard of Perfection. Practice will be given in the study of feather markings, judging and fitting of birds for show. Two and two-thirds hours' credit. Lectures, two hours, and one 2-hour laboratory period, per week. Fee, $2.00.

31. **Poultry Management.** This includes a study of poultry houses, arrangement of buildings and yards, feeds and feeding, judging for market types, incubation, brooding, anatomy of fowl and egg diseases, sanitation, caponizing, killing, dressing and marketing of poultry products. Two and two-thirds hours' credit. Lectures, two hours, and one 2-hour laboratory period, per week. Fee, $2.00.

32. **Practice in Poultry Feeding and Management.** The student will be given charge of a pen of fowls and will be required to keep a record of the amounts and cost of food consumed, gains made, eggs produced and calculate the profit or loss. This work will cover a period of three weeks, and the student must be present morning, noon and afternoon, time to be arranged by appointment with instructor. Prerequisite, Courses 31 and 37. One hour's credit. Fee, $2.00.

33. **Incubator Practice.** Each student will be given charge of one or more incubators for the period of one hatch and required to keep the records of fuel consumed, temperatures, infertile eggs, dead germs, dead in shell, chicks hatched, and reckon the cost of incubation. This course will cover a period of four weeks and the student must be present morning, noon and afternoon, time to be arranged by appointment with the instructor in charge. Prerequisites, Courses 31 and 37. One hour credit. Fee, $2.00.

34. **Brooder Practice.** Each student will be given charge of chicks in a brooder for four weeks from time of hatching and must keep records of temperatures, fuel and foods consumed, gains made, mortality, and calculate the cost of brooding. The student will be required to be present morning, noon and afternoon, time to be arranged by appointment with instructor. Prerequisites, Courses 31, 33 and 37. One hour credit. Fee, $2.00.

35 and 36. **Poultry Research and Experimentation.** This course is intended for those students who wish to fit themselves especially for college and experiment station work in Poultry Husbandry. This course will include a report of special research on some poultry topic, a study of the Poultry Husbandry work now being carried on in the experiment stations throughout the country, methods and technique of breeding for egg production and meat types, arrangement of experimental records and data in feeding, breeding, incubation and brooding. Students electing this course should also take their thesis in Poultry Husbandry. This course extends throughout the year. Time by appointment. Prerequisites, Courses 31 and 37. One hour credit each semester. Fee, $2.00.

37. **Poultry Management.** This course continues the work started in Course 31. Two and two-thirds hours' credit. Lecture, two hours, and one 2-hour laboratory period per week. Fee, $2.00.

38. **Practice in Poultry Fattening.** Each student will be given charge of and feed several lots of fattening stock, comparing different methods and rations for fattening poultry. Records must be kept

showing the amounts and cost of food fed, amounts and cost of gains in weight, cost per pound of gain, and calculations made of the profit or loss on each lot of stock. This course will cover a period of three weeks and the student must be present morning and evening, time to be arranged by appointment with instructor. Prerequisites, Courses 31 and 37. One hour credit. Fee, $2.00.

39. **Advanced Poultry Judging.** Practice and study in breeding and judging standard varieties of poultry and instruction in show room management. Lectures and laboratory one 2-hour period per week. Prerequisite, Course 30. One hour credit. Fee, $2.00.

40. **Poultry Seminar.** The poultry seminar meets once every two weeks during the college year. Papers are presented and discussed by members on poultry management, breeding, diseases, poultry organizations, investigations of poultry farms and packing house and other current topics. This course is open only to senior and special students of the Poultry Department. Prerequisites, Courses 31 and 37. Time by arrangement. One hour credit.

41. **Anatomy and Physiology of Poultry.** Includes a study of the comparative anatomy and physiology of various species of poultry, special emphasis being laid upon the forms and functions of the bones, digestive, respiratory and reproductive systems of the common fowl. Lectures one hour per week and forty-eight actual hours of laboratory work near the end of the semester. Prerequisites, Courses 31 and 37, and Veterinary 56 and 23. Two hours' credit. Fee, $2.00.

42. **Marketing of Poultry Products.** Includes a study of the market classifications of poultry, eggs and feathers, methods of dressing, packing, shipping and selling, requirements of different markets, poultry and egg boards, cold storage of poultry and eggs. Two lectures per week. Prerequisites, Courses 31 and 37. Two hours' credit.

ONE-YEAR POULTRY HUSBANDRY COURSE.

This course is intended for those students who wish to prepare themselves for practical poultry work and have but one year to devote to study and practice. The course will consist of Courses 30 to 34 and 37 to 42, inclusive, practical work on the Poultry Farm, and such work in Animal Husbandry, Horticulture or other departments as may be best adapted to each individual student. The practical work wil consist of five to eight hours of work per day in the caring for poultry, building of colony houses, running incubators and brooders, killing and dressing, mixing of feeds, and such other work as is ordinarily done on a poultry farm. This gives the student a chance to acquire that skill which comes only from practice.

Department of Horticulture and Forestry.

SPENCER AMBROSE BEACH, PROFESSOR.

ARTHUR THOMAS ERWIN, ASSOCIATE PROFESSOR, HORTICULTURE.

CHARLES ANDERSON SCOTT, ASSOCIATE PROFESSOR, FORESTRY.

ROGER SHERMAN MACINTOSH, INSTRUCTOR.

GEORGE RAYMOND BLISS, EXTENSION WORK.

JOHN REARDON, GARDENER.

The department of Horticulture and Forestry, with its orchards, plantations of small fruits and vegetables, forest garden, forest area, pomological and forestal museums, greenhouses, laboratories and library, affords excellent opportunities for instruction and research.

A large part of the library of the Department is kept in its offices in the Hall of Agriculture where it is available to students specializing in this line of work. Besides a fairly complete collection of publications pertaining to horticulture and forestry and files of numerous periodicals, it also includes the complete library of Charles Downing containing his original drawings and manuscripts and many rare and valuable works on horticulture and forestry.

About 100 acres of land are now available for horticultural and forestal purposes including a recently added tract of sixty acres on which orchards and forest plantations are being developed. Besides this the campus of more than 100 acres affords opportunities for instruction concerning ornamental trees and plants and landscape design.

Orchard trees ranging in age from one to more than twenty years represent the hardiest types of cultivated fruits both native and foreign and include over a thousand varieties. Several thousand seedling varieties which have been originated in the work in plant breeding are being tested in the orchards and nurseries. Various methods of stratification, layering, budding, grafting and other operations with plants are given practical illustration in the greenhouses and nurseries. Leading types of vegetables are grown to afford opportunity for study in this line of work.

The past few years have witnessed a wonderful development in the science of Forestry due in large part to the increasing scarcity of timber so necessary in the development of every state and community. Large manufacturers and lumbermen are turning to practical forestry as a means of insuring the permanency of their industries. This is causing an increasing demand for trained men to manage our existing forests, provide for future crops, and reclaim barren non-agricultural lands by tree planting. The Government Forest Service calls for a number of college graduates each year and trains them in scientific forestry work. To meet these numerous demands for men, several colleges and universities, including this one, are giving courses of instruction in Forestry.

The questions that are of greatest importance in the development of forestry in Iowa are the formation, care and harvesting of the farm grove and woodlot and the prevention of stream erosion by tree planting, hence special attention is paid to these problems. Although Iowa is classed as a prairie state, yet there excellent opportunities for the practical study of forestry in many parts of the state. There are several planted groves and considerable timber upon and near the college campus.

The museum of the department contains a large collection of woods native to this country, tropical America and the Philippine Islands. This affords the student ample opportunity for becoming acquainted with the structure and gross appearance of the principal commercial timbers on the markets of this country.

HORTICULTURE AND FORESTRY IN WINTER SHORT COURSE.

(January 2 to January 14, 1911.)

The Department of Horticulture and Forestry offers work during the winter short course which is designed especially to meet the needs of men who have not the opportunity to take a complete course. Instruction is given in up-to-date methods of combating insects and diseases of the orchard and garden and in the operation of various kinds of spraying apparatus from hand pumps to gasoline power machines. Other subjects studied are the harvesting and storage of apples, especially the handling of apples in cold storage; varieties best adapted to the various sections of the state both for home use and commercial planting; pruning and other practical topics pertaining to orchard management; propagation of plants including grafting, layering, budding and the growing of cuttings; management of farm woodlots and planted groves; most profitable trees to plant; treatment of posts to prevent decay; and the laying out and ornamental planting of home grounds.

The college campus affords excellent opportunity for studying the different varieties of deciduous trees, evergreens, and other ornamentals. Leading varieties of orchard fruits and potatoes from different sections of the state are supplied for exhibition and laboratory use.

COURSE IN HORTICULTURE AND FORESTRY.

For Freshman year, see Agricultural Course, page 77.

Sophomore Year.

THIRD SEMESTER.

		Required Semester Hours.
Horticulture 1,	Vegetable and Greenhouse Crops	2⅔
Horticulture 19,	Dendrology	⅔
Agricultural Engineering 4,	Farm Engineering	3⅓

Soils 1,	Soil Physics	4
Agricultural Chemistry 21,	Elementary Experimental Chemistry	5
Economic Science 9,	Outlines of Economics	3
Military 3, or Athletics,		—
	Total semester hours	18⅔

FOURTH SEMESTER.

		Required Semester Hours.	
Horticulture 7,	Pomology	2	
Horticulture 15,	Silviculture	2	
Agricultural Engineering 8,	Spraying Apparatus	1	
Zoology 16,	General Zoology	5	
Agricultural Chemistry 23,	Elementary Experimental Chemistry	5	
Choice: Economic Science 10,	Agricultural Economics	3	3
History 6,	French Revolution and XIXth Century	3	
Military 4, or Athletics,		—	
	Total semester hours	18	

Junior Year.

FIFTH SEMESTER.

			Required Semester Hours.	
Choice: Horticulture 5, and	Advanced Pomology	2⅔	3⅓ or	6
Horticulture 30,	Fruit Judging	⅔		
Horticulture 18, and	Forest Utilization	2		
Civil Engineering 508,	Surveying	4		
Soils 13,	Soil Surveying and Mapping		1⅔	1⅔
Zoology 4,	Entomology		4	4
Agricultural Chemistry 25,	Agricultural Chemistry		4	4
English 12,	Argumentation		2	2
Horticulture 28,	Seminar		½	½

This course must be continued throughout the year. Final standing will not be certified to the recorder until the close of the sixth semester.

	—	—
	15½	18⅙
Electives will be selected from the list on page 134,	½	4½
	—	—
Total semester hours	16	to 20

SIXTH SEMESTER.

			Required Semester Hours.	
Choice: Bacteriology 1,	General Bacteriology	4	4	6
Horticulture 16, and	Forest Development and Policy	2		
Civil Engineering 609,	Surveying	4		
Botany 11.	Vegetable Physiology		4	4

Botany 15,	Systematic Botany	3	3
Horticulture 28,	Seminar	½	½
(See note fifth semester.)			
		11½	13½
Electives will be selected from the list on page 134,		4½	8½
	Total semester hours	16	to 20

Senior Year.

SEVENTH SEMESTER.

			Required Semester Hours.	
Choice	Botany 24, and	Plant Embryogeny	1	
	Horticulture 4,	Plant Breeding	3	
	Bacteriology 1,	General Bacteriology		4
	Horticulture 8,	Landscape Gardening	2	2
	Horticulture 9,	Research Work	2	2
	Geology 10,	General Geology	4	4
	Agric. Journalism 1,	Agricultural Journalism	1	1
	Horticulture 29,	Seminar	½	½

This course must be continued throughout the year. Final standing will not be certified to the recorder until the close of the eighth semester.

		13½	13½
Electives will be elected from the list on page 134,		2½	6½
	Total semester hours	16	to 20

EIGHTH SEMESTER.

		Required Semester Hours.	
Horticulture 17,	Wood Technology	1⅔	1⅔
Botany 5,	Vegetable Pathology	3	5
Soils 2,	Soil Fertility	4	4
Horticulture 13,	Thesis	2	2
Horticulture 31,	Landscape Architecture	⅔	⅔
Horticulture 29,	Seminar	½	½
(See note in seventh semester)			
		11⅚	13⅚
Electives will be elected from the list on page 134,		4⅙	8⅙
	Total semester hours	16	to 20

COURSES IN HORTICULTURE.

1. **Vegetable and Greenhouse Crops.** The general culture of vegetables in the field and under glass and also other commercial crops grown under glass. Recitations, two hours, and laboratory, two hours, per week. Two and two-thirds hours' credit.

2. **Plant Propagation.** Propagation of plants by sexual and non sexual methods, germination, testing and storage of seeds, multiplication of plants by cuttage, layerage and graftage, including both greenhouse and nursery types. Recitations, two hours, and laboratory, two hours, per week. Two and two-thirds hours' credit. Fee, $1.00.

3. **Orcharding.** The establishment and care of home orchards and vineyards; systematic study of varieties adapted for planting in Iowa. Recitations, two hours, and laboratory, two hours, per week. Two and two-thirds hours' credit. Fee, $1.00.

4. **Plant Breeding.** Study of the principles of plant breeding and their application to the improvement of plants. Horticulture 2, Botany 11, and Botany 24, prerequisite or required with this course. Recitations, three hours per week.

5. **Advanced Pomology.** Commercial orcharding; grading, storing, and marketing fruit; fruit judging; orchard and nursery technique. Prerequisites, Horticulture 2 and 7. Recitations, two hours, and laboratory, two hours, per week. Two and two-thirds hours' credit. Fee, $1.00.

7. **Pomology.** A study of the problems involved in the establishment and care of orchards; orchard technique; spraying; tillage and soil management. Prerequisites, Horticulture 2 and Agricultural Chemistry 21. Two lectures and six hours laboratory during the last half of the semester. Two hours' credit.

8. **Landscape Gardening.** A study of the principles involved in the planting and decoration of home grounds and parks; ornamentals adapted to planting in Iowa. The ornamental trees and shrubs on the campus and in the department afford excellent material for laboratory work. Two lectures per week. Two hours' credit.

9. **Research Work.** An independent investigation in some line of work under the supervision of the head of the department. Two hours per week. Two hours' credit.

11. **Floriculture.** No course prerequisite. Propagation and general management of house plants and ornamentals for the home grounds. Recitations, two hours per week.

13. **Thesis.** The subject chosen must be one requiring independent investigation, the results of which are to be presented in a carefully written report. May be a continuation of Course 9. Two hours' credit.

28. **Horticulture and Forestry Seminar.** Horticulture and Forestry seminars will each meet once in two weeks while the College is in session, and have for their members the professors and instructors in Horticulture and Forestry, and all students in the Junior and Senior classes in the course in Horticulture and Forestry. The work will consist in the preparation, presentation, and discussion of papers on Horticulture and Forestry topics. All papers must be carefully written and submitted to the professor in charge. The schedule

of subjects is made up one semester in advance. The credit in this subject will be reported to the recorder at the close of the spring semester. One hour credit.

29. **Seminar.** A continuation of Course 28. The credit to be reported at the close of the eighth semester. One hour credit.

30. **Fruit Judging.** Scoring and judging plate displays and collections of fruit. Special attention given to the leading commercial varieties of the apple. Prerequisite, Horticulture 2 or 3. Laboratory, two hours per week. Two-thirds hour credit.

31. **Landscape Architecture.** A laboratory course in landscape designing. Prerequisite, Horticulture 8 or 11. One laboratory per week. Two-thirds hour credit.

32. **Landscape Architecture.** A continuation of Course 31 and may be taken simultaneously. One laboratory per week. Two-thirds hour credit.

COURSES IN FORESTRY.

14. **Farm Forestry.** The life history of trees and the relation of trees to their environment; their relation to each other in the forest; their requirements for light, heat, moisture. Attention is given to the study of the influence of forests in the modification of climatic conditions with special reference to the effect of windbreaks in agricultural districts. The establishment of windbreaks, shelterbelts, and farm woodlots in Iowa. The species best suited for such planting, the kind of stock to plant and the cost of planting. The rejuvenation of natural woodlots; the preservative treatment of farm timber supplies. The classification and identification of the conifers. This course is designed to treat in a general way the forest problems that confront the Iowa farmers. Text, Principles of American Forestry, Green. Two and two-thirds hours' credit: Recitations, two hours, and field work, supplemented by lectures, two hours, per week.

15. **Silviculture.** This course is a continuation of Horticulture 19, and includes a study of the distribution and character of our native forests; methods of natural reproduction, artificial regeneration; planting seeds, care of the nursery, transplanting and planting out seedlings, treatment of woodlands; pruning, thinning, improvement cutting, and underplanting. A study of forest types and silvicultural systems, suitable for given forest conditions. Two recitations per week. Prerequisite, Horticulture 19. Two hours' credit.

16. **Forest Development and Policy.** Attitude of nations toward forestry; development of forestry in the United States; relation of forestry to national reclamation work; protection of forests against natural enemies. Two hours' credit. Two recitations per week. Text, History of Forestry, Fernow.

17. **Wood Technology.** A study of common woods, their uses, and identification by structural characteristics; methods and effects

of drying; methods and effects of preservative treatment. One and two-thirds hours' credit. One hour recitation and two hours laboratory.

18. **Forest Utilization.** Study of economic relations of timber to manufacturing industries; methods of logging; conversion of timber into finished products; consumption of timber products; grading of lumber. Prerequisite, Horticulture 15, and one season's work in lumber camp or mill. Two hours' credit. Two recitations per week.

19. **Dendrology.** The work in this course includes a study of the classification and identification of the broad-leaved species in both summer and winter characteristics. Each student is required to prepare a complete herbarium of broad-leaved species in full foliage and also in naked condition. The gathering and storing of forest tree seeds and the general care of nursery stock throughout the winter is taken up in this course and continued in Horticulture 15. This course is introductory to Horticulture 15. Two hours' field work per week and required preparation. Prerequisite, Horticulture 14. Text, Sargent's Manual of Trees of North America. Two-thirds hour credit.

20. **Timber Physics.** A study of woods, their uses and identification by structural characteristics. Methods and effects of drying timbers; methods and effects of preservative treatment of timbers. The identification of native and planted trees. Two hours' credit. Laboratory and reference work in identification of species by structural characteristics. Field work supplemented by lectures and reference work. Two hours per week.

21. **Forest Mensuration.** The work in this course embraces the measurements of felled and standing timber, determining the merchantable and total volume of single trees and entire stands, determining the annual increment in diameter and volume. Special attention is given to the use and construction of log rules and to the estimating of standing timber. Two hours' credit. Field work six hours per week. Text, Forest Mensuration, Graves.

Department of Agricultural Engineering

JAY BROWNLEE DAVIDSON, PROFESSOR.

EVERETT WALTER HAMILTON, ASSISTANT PROFESSOR.

DANIEL WILLIS SYLVESTER, INSTRUCTOR.

CHARLES OSMOND ALEXANDER, INSTRUCTOR.

E. Y. CABLE, EXTENSION WORK.

The development of modern agricultural machinery, the increase in the size and importance of farm structures, the improvement of land by drainage and its reclamation by irrigation and the need of better roads, demand that the successful farmer of today must be trained along mechanical and engineering lines. To supply this training and to investigate problems related thereto is the work of the Department of Agricultural Engineering.

It is believed that the Department of Agricultural Engineering has the most complete equipment of any similar department in existence. The department occupies the two lower floors of Agricultural Engineering Hall and practically all of Agricultural Engineering Annex, a fireproof building connected with former building on the ground and first floors.

The farm machinery laboratories are located on the ground and first floors of the Annex. Each floor has a large balcony entirely surrounding the room and increasing the floor space by over one-half. A large assortment of the best modern farm machinery is contained in these laboratories.

This farm machinery equipment contains samples of traction engines, gasoline tractors, and one or more samples of almost every kind of the important lines of field and power machine used on the farm. Special apparatus for testing draft adjustment and quality of work is used in connection with these machines, including a Kohlbush direct reading dynamometer, a Stone and a Polikeit recording traction dynamometers and a special chain recording transmission dynamometer of twenty-five horsepower capacity. By means of this instrument, it is possible to accurately measure the power consumed by the smallest belt-driven machines as well as those requiring the full capacity of the instrument. Numerous other small instruments and parts of machines are used in this connection.

For instruction in gasoline engines, eight modern engines are provided, nearly every one representing a different type of construction. To test these, suitable brakes, indicators and other testing appliances are owned by the Department.

The steam engine laboratory contains a simple twenty horsepower engine and a thirty-five horsepower compound reversing engine. Steam is now provided from the heating plant back of the building, but a boiler will be placed in the laboratory within the next year.

Two drawing rooms are provided which will accommodate twenty-five and forty students, respectively. The cement laboratory contains bins for materials, molds, forms, an improved Fairbanks cement testing machine, and smaller apparatus. The pump laboratory contains an assortment of pumps, cylinders, tanks, and the spraying apparatus.

For teaching the course in Farm Engineering, the following instruments are provided: two Gurley transits, one Burger level, five Queen levels, five Gurley levels, and two Bostrom and Brady levels; also rods, flagstaffs, chains, hatchets, etc.

In the museum, samples of materials and ancient implements are kept. A reading and seminar room has files of all the leading periodicals pertaining to agricultural engineering and is used as a meeting room for the Agricultural Engineering Seminar.

The Forge shop is equipped with twenty Buffalo down draft forges and individual tool sets together with a complete set of special tools, a press drill and grinder. The carpenter shop has benches and tool sets for thirty students and a miscellaneous tool equipment is provided in the tool room. This shop is also provided with a power cross cut and rip saw, a planer and two speed lathes.

The work of the Department is carried on in conjunction with the Agricultural Engineering Section of the Agricultural Experiment Station. An experimentalist devotes his entire time to research and is provided with a separate laboratory. This laboratory has many special instruments in the way of dynamometers, indicators, and testing machines, and also a tool equipment including a fourteen-inch engine lathe.

Commodious offices are provided for the members of the Department, in which is to be found a complete implement and farm machine catalog file, also a valuable collection of farm building plans.

COURSE IN AGRICULTURAL ENGINEERING.

The Work of the Department is principally that of giving instruction to those who intend to make the farm the object of their life work; however, the demand for instructors and others trained along these lines requires the department to offer special instruction to meet this demand.

Positions Open for Men Trained Along Agricultural Engineering Lines.

The course in Agricultural Engineering is designed to fit graduates for the following lines of work:

1. Managers and superintendents of farms, where drainage, irrigation and the use of agricultural machinery is a large factor in the management.
2. Teachers and instructors of Agricultural Engineering in agricultural colleges.
3. Teachers of practical mechanics in Agricultural High Schools.
4. Government experts in Agricultural Engineering.
5. Professional work in drainage and highway engineering.
6. Positions in the farm machinery industry requiring mechanical skill and a knowledge of the science of agriculture.

The degree of Bachelor of Agricultural Engineering (B. A. E.) is given to students who have completed a four-year course in Civil, Mechanical, or Electrical Engineering, followed by one year's prescribed work approved by the faculty, in Agricultural Engineering and related sciences, under the rules and conditions governing work in other courses.

Following is a course in Agricultural Engineering which is offered for the first time. This course is designed to be especially strong along the fundamental sciences upon which Agricultural Engineering depends.

COURSE IN AGRICULTURAL ENGINEERING.

Freshman Year.

FIRST SEMESTER.

		Required semester hours
Agricultural Engineering 1 or 2	Shop Work	1⅓
Animal Husbandry 1	Market Types of Cattle and Sheep	2
Farm Crops 1	Corn Growing and Judging	2⅔
Horticulture 14	Farm Forestry	2⅔
English 10	Narration and Description	3
Mathematics 20	Algebra	4
Mathematics 21	Plane Trigonometry	1
Mechanical Engineering 181	Mechanical Drawing	1
History 17	The American People	1
Military 1	Military	
Library	Library Instruction	
	Total semester hours	18⅔

SECOND SEMESTER.

		Required semester hours
Agricultural Engineering 1 or 2	Shop Work	1⅓
Animal Husbandry 2	Market Types of Dairy Cattle, Horses and Swine	2
Dairying 12	Farm Dairying	2⅔
Farm Crops 2	Grains, Grasses and Forage Crops	2⅔
English 11	Exposition	3
Mathematics 22	Trigonometry	2
Mathematics 23	Analytical Geometry	3
Military 2	Military Drill	
Mechanical Engineering 220	Descriptive Geometry	2
	Total semester hours	18⅔

Sophomore Year.

THIRD SEMESTER.

		Required semester hours
Agricultural Engineering 4	Farm Engineering	3⅓
Mathematics 24	Analytical Geometry	2
Mathematics 25	Calculus	3
Physics 303	Mechanics and Heat	5
Mechanical Engineering 322	Mechanical Drawing	1
Chemistry 21	Agricultural Chemistry	5

Military or Athletics		
		—
	Total semester hours	19⅓

FOURTH SEMESTER.

		Required semester hours
Agricultural Engineering 5	Farm Machinery and Farm Motors	2⅔
Chemistry 23	Elementary Experimental Chemistry	5
Physics 404	Electricity and Magnetism and Light and Sound	5
Mathematics 26	Differential and Integral Calculus	4
Mechanical Engineering 401	Analytical Mechanics	3
Military or Athletics		
		—
	Total semester hours	19⅔

Junior Year.

FIFTH SEMESTER.

		Required semester hours
Agricultural Engineering 3	Farm Blacksmithing and Horseshoeing	1⅓
Agricultural Engineering 7	Dairy Engineering	1⅔
Soils 1	Soil Physics	4
Mechanical Engineering 502	Analytical Mechanics	5
Mechanical Engineering 512	Engineering Laboratory	1
Economic Science 9	Outlines of Economics	3
Civil Engineering 345	Surveying	2
Agricultural Engineering 14	Seminar	½

This course must be carried throughout the year, and final standing will not be certified to the recorder until the close of the sixth semester.

		—
	Total semester hours	18½

SIXTH SEMESTER.

		Required semester hours
Agricultural Engineering 6	Rural Architecture	3
Agricultural Engineering 9	Research Work in Agricultural Engineering	2
Soils 2	Soil Fertility	4
Mechanical Engineering 606	Analytical Mechanics	5
Mechanical Engineering 613	Engineering Laboratory	1
Civil Engineering 653	Materials of Construction	2
Civil Engineering 446	Surveying	2
Agricultural Engineering 14	Seminar	½

(See note fifth semester.)

		—
	Total semester hours	19½

Senior Year.

SEVENTH SEMESTER.

		Required semester hours	
Agricultural Engineering 10	Research in Agricultural Engineering	2	
Farm Crops 8	Farm Management	2⅔	
Horticulture 8	Landscape Gardening	2	
Veterinary 44	Sanitary Science	2	
Mechanical Engineering 714	Laboratory	1	
English 12	Argumentation	2	
Animal Husbandry 20	Animal Feeding	2	
Agricultural Engineering 15	Seminar	½	
This course must be carried throughout the year, and final statements will not be certified to the recorder until the close of the eighth semester.		—	—
		14⅙	
Electives will be selected from list on page 134,		1⅚ to	5⅚
		—	—
	Total semester hours,	16	to 20

EIGHTH SEMESTER.

		Required semester hours	
Agricultural Engineering 11 or 12		3	5
Mechanical Engineering 533	Shop Work	2	2
Horticulture 20	Timber Physics	2	2
History 18	The American Statesman	1	1
Horticulture 31	Landscape Laboratory	⅔	⅔
Agricultural Engineering 15	Seminar	½	½
(See note seventh semester.)		—	—
		9⅙	11⅙
Electives will be selected from list on page 134,		6⅚ to	10⅚
		—	—
	Total semester hours,	16	to 20

COURSES IN AGRICULTURAL ENGINEERING.

1. **Shop Work.** Blacksmithing, forging and welding of iron and steel, and making and tempering hand-tools. Work designed to be especially helpful in the repair and operation of machinery. One and one-third hours' credit. Four hours per week. Fee, $2.50.

2. **Shop Work.** Carpentry, care, use and sharpening of tools, laying off work, making of joints and framing. Work designed to be especially helpful in the planning, framing, and construction of farm buildings. One and one-third hours' credit. Four hours per week. Fee, $2.50.

LIBRARY
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3. **Farm Blacksmithing and Horse Shoeing.** An advanced course in blacksmithing. One and one-third hours' credit. Laboratory, four hours per week. Fee, $2.50.

4. **Farm Engineering.** Includes instruction in Agricultural Surveying, also a study of location of drainage districts, drainage laws, and best systems of drainage; location and construction of roads; the building of fences and concrete construction in farm work; also drawing, including lettering, map making, planning of drainage systems and road profiles; and field work, including care, adjustment and practice in the use of surveying instruments. Prerequisite, Mathematics 17. Three and one-third hours' credit. Recitation, two hours, and laboratory, four hours, per week. Fee, $2.00.

5. **Farm Machinery and Farm Motors.** Includes a brief study of mechanics and materials; a study of the development, construction, functions and methods of operating, adjusting and repairing implements and machinery; also the study of the principles of draft and the production of power. Laboratory work devoted to the comparative analysis and testing the machines discussed in the class room. Two and two-thirds hours' credit. Recitations, two hours, and laboratory, two hours. Fee, $2.00.

6. **Rural Architecture.** Embraces the planning of all farm buildings, a study of their construction, lighting, ventilation, cost, convenience, also testing the strength of building materials, and making of plans and specifications. Prerequisite, Agricultural Engineering 4. Three hours' credit. Recitation, one hour, and laboratory, six hours, per week.

7. **Dairy Engineering.** Special work in the management, care and operation of steam and gasoline engines. One and two-thirds hours' credit. Recitation, one hour, and laboratory, two hours, per week. Fee, $2.00.

8. **Spraying Apparatus.** Precedes Field Practice in Horticulture 7 in the same semester. A brief study of the mechanics of pumps, also the care, operation and repair of spraying apparatus. One hour credit. Recitation, one hour, and laboratory, three hours, per week for one-half semester. Fee, $1.00.

9. **Research Work in Agricultural Engineering.** The large equipment of machinery and instruments in this department offers to the student a wide range of subjects for research work, as Drainage, Farm Water Supply, Sewerage, Road Construction, Fences, Use of Cement on the Farm, Testing and Calibrating Various Farm Machines and Traction Tests. Prerequisites, Agricultural Engineering 4 and 5. Two hours' credit. Fee, $2.00.

10. **Research Work in Agricultural Engineering.** Work same as in 9. Prerequisites, Agricultural Engineering 4 and 5. Two hours' credit. Fee, $2.00.

11. **Thesis.** Must be upon some subject requiring original work taken in Agricultural Engineering. Three hours' credit.

12. **Thesis.** Same as Agricultural Engineering 11, except five hours' credit.

13. **Gas and Oil Engines.** May be substituted for part of Agricultural Engineering 9 and 10 in the Agricultural Engineering Course. A comprehensive course in the practical operation and management of the internal combustion engine. The course includes a study of the development, the existing types, the theory and practice of operation, the adjustment, the repair and the utility of gas, gasoline, oil, and alcohol engines. The laboratory work will consist of well arranged tests and exercises to familiarize the student with the practical care and management of this type of motor. One recitation and one laboratory period per week. Two hours' credit. Fee, $2.00.

14. **Agricultural Engineering Seminar.** One hour credit.

15. **Agricultural Engineering Seminar.** One hour credit.

The Agricultural Engineering Seminar (Courses 14 and 15) meets once each two weeks while College is in session and has for its members the professors and instructors in Agricultural Engineering and all students in the Junior and Senior Classes in the course in Agricultural Engineering. This consists in the preparation, presentation and discussion of papers on Agricultural Engineering subjects. All papers must be carefully written and submitted to the professor in charge. The schedule of subjects are made up one semester in advance.

SCIENCE AND AGRICULTURE.

The field of Agriculture presents such rapid changes and there is such wide and varied demand for young men combining agricultural and scientific training that it has been deemed advisable to offer a course less technical than the other agricultural courses that relate directly to some special line.

The course in Science and Agriculture is designed to meet the demands of country agricultural high schools and other institutions, public and private, established for the purpose of giving instruction in the general sciences and elementary instruction in agriculture. There will doubtless arise a large demand for strong, broadly educated, well trained teachers for this and other kinds of agricultural instruction in public and preparatory schools where the work is now being introduced.

A new phase of agricultural education has developed in recent years in the various forms of agricultural extension work. This movement is destined to be far reaching in its results and it is clearly one of the most potent influences in the field of agriculture. This phase of agricultural instruction, which is bringing science to the aid of agriculture by reaching the man in the field and on the farm, the children in the public school and the family in the home, is calling for well trained men far in excess of the supply.

COURSE IN SCIENCE AND AGRICULTURE.

Freshman Year.

FIRST SEMESTER.

		Required Semester Hours
Farm Crops 1	Corn Growing and Judging	2⅔
English 10	Narration and Description	3
Mathematics 17	Algebra and Trigonometry	3
History 19	The Making of the Nation, 1783-1817.	2
Bacteriology 1	General Bacteriology	4
Agricultural Chemistry 21	Elementary Experimental Chemistry	5
Military 1		
		19⅔

SECOND SEMESTER.

		Required Semester Hours
Farm Crops 2	Grains, Grasses and Forage Crops	2⅔
English 11	Exposition	3
Physics 205	Mechanics, Heat and Light	3
Agricultural Chemistry 23	Elementary Experimental Chemistry	5
Zoology 16	General Zoology	5
Military 2		
		18⅔

Sophomore Year.

THIRD SEMESTER.

		Required Semester Hours
Animal Husbandry 1	Market Types of Cattle and Sheep	2
Horticulture 19	Dendrology	⅔
Horticulture 3	Orcharding	2⅔
Zoology 4	Entomology	4
Agricultural Chemistry 25	Elementary Experimental Chemistry	4
Economic Science 9	Outlines of Economics	3
English 12	Argumentation	2
Military 3, or Athletics		
		18⅓

FOURTH SEMESTER.

		Required Semester Hours
Animal Husbandry 2	Market Types of Dairy Cattle, Horses and Swine	2
Farm Crops 4	Grain Breeding and Judging	2
Horticulture 2	Plant Propagation	2⅔
Horticulture 15	Silviculture	2
Botany 15	Systematic Botany	3
Agricultural Chemistry 26	Elementary Experimental Chemistry	4
History 4	Division and Reunion	3
Military 4, or Athletics		
		18⅔

Junior Year.

FIFTH SEMESTER.

At the beginning of the Junior year one of the two optional groups of studies listed for the Senior College must be selected. Students who elect an Optional Group will be required to carry the studies of that group as listed or arranged for the Junior and Senior years.

			Required Semester Hours
Required:			
Soils 1		Soil Physics	4
Literature 4		American Literature	3
			7
Optional:			
Group I:	History 20	History of Education	2
	Psychology 7	Descriptive Psychology	3
			5

Elective:

The student with the approval of the Dean of Agriculture, will select from the list of electives on page 134, enough work to make a total of from sixteen to twenty hours per week.

The studies listed under Optional Group I, throughout the Junior and Senior years, except Economic Science 16, are required to secure without examination a five-year State Teacher's Certificate upon graduation. Those who do not take these subjects will be entitled to a two-years' State Teacher's Certificate upon graduation, but will be required to pass an examination upon them within two years to have the certificate renewed.

Group II: The student shall select from one of the agricultural courses, with the approval of the Dean of Agriculture and the Head of the Department concerned, a major line or a major and a supporting line of study of not less than seven hours per week during any one semester. The total number of hours of the major line, however, shall not be less than twenty hours for the two years.

SIXTH SEMESTER.

		Required Semester Hours
Required:		
Botany 11	Vegetable Physiology	4
Soils 2	Soil Fertility	4
		8
Optional:		
Group I: Economic Science 16	Actual Government	3
History 21	History of Education	2
Psychology 8	Descriptive Psychology	3
		8

See statement for Optional Group I, first semester, Junior Year.

Group II: See statement for Group II, first semester, Junior Year.

Elective:

The student, with the approval of the Dean of Agriculture, will select from the list of electives on page 134, enough work to make a total of from sixteen to twenty hours per week.

Senior Year.

SEVENTH SEMESTER.

		Required Semester Hours
Required:		
Botany 5	Vegetable Pathology	3
Geology 10	General Geology	4
		7
Optional:		
Group I: Psychology 5	Psychological Principles of Education	3
Civics 11	Methods of Teaching	2
		5

See statement for Optional Group I, first semester, Junior Year.

Group II: See statement for Group II, first semester, Junior Year.

Elective:

The student, with the approval of the Dean of Agriculture, will select from the list of electives on page 134, enough work to make a total of from sixteen to twenty hours per week.

EIGHTH SEMESTER.

Optional:

Group I:	Psychology 6	Child Psychology	3
	Civics 12	Methods of Teaching	2
			5

See statement for Optional Group I, first semester, Junior Year.

Group II: See statement for Group II, first semester, Junior Year.

Elective:

The student, with the approval of the Dean of Agriculture, will select from the list of electives on page 134, enough work to make a total of from sixteen to twenty hours per week.

Department of Agricultural Journalism

CLIFFORD VERNE GREGORY, ASSISTANT.

Four years ago a chair in Agricultural Journalism was established at the Iowa State College by the aid of Mr. John Clay, of the firm of Clay, Robinson & Co., of Chicago. This was distinctly a new departure in the field of agricultural education. By many agricultural journalism was looked upon as a field of labor of peculiar limitations, a field in which excellence could be obtained by heredity, but not by training or study. Mr. Clay, who is himself a most forcible writer, combining to a remarkable degree a wide range of practical information and a fascinating style, believed that training would count for something in this, as in all other lines of agricultural work. His address on "The Plow and the Book," delivered at Ames at the inception of this movement, has attracted wide attention.

The work, though started in a moderate way, has led to highly gratifying results. It has proven popular with the agricultural students, who have learned that there is great benefit to be derived from the study of this important subject. The graduates who have taken this work at Ames have given good account of themselves. A student who graduated two years ago immediately took a position on one of the leading agricultural papers. At the end of his first year's service his employer was pleased to contract with him for three years' service at a salary of $2,500 for the third year. A student who graduated a year ago accepted a similar position on another paper and within a short time was advanced to an important editorial position on another paper of wide influence. One of the graduates in the class of 1908 was given an immediate position as associate editor on one of the leading western farm weeklies. A student in the 1909 class left school to accept a very attractive position as associate editor on one of the best farm papers in the East.

Not all students are qualified for editorial work, but all may be helped and strengthened by a good course in agricultural journalism, whether they intend to follow this calling or not. The ability to prepare a concise, readable article for publication is invaluable to the agricultural college graduate, no matter what line of work he intends to take up.

A man who has employed a number of Ames men for special work along this line said he had never yet been disappointed in one of them. An editor of a prominent agricultural paper, after passing on the work of one of the classes, said: "I don't think I need hesitate to say that I never got hold of nine articles that showed more uniform excellence, more care in preparation and observance of instruction received in the classroom."

In the Live Stock World reporting contest at the 1906 International, Ames men won three out of four first prizes and one-half of the money offered. In the National Corn show contest in 1907, Ames students won thirty-five out of sixty prizes and 68 per cent of the money offered, in competition with one hundred and fifty contestants from nine states. In the Iowa Corn Growers' contest in 1908, Ames students won first, second and third prizes and all of the money offered. All of these contests were based upon writing on practical subjects, with practical men as judges.

The work in agricultural journalism is proving that this subject has a place in the curriculum of a modern, well-equipped agricultural college, and in the education of the future farmer. The work not only stimulates a study of the essentials of agricultural journalism, but it admirably supplements a student's training in English, in clear, concise expression, and his knowledge of general agricultural topics.

1. **Beginning Journalism.** This course is a general introduction to the study of Agricultural Journalism. The subject is taken up mainly from the contributor's standpoint. The aim of the course is to teach the student to write concise, readable, newspaper English. A lecture is given every two weeks, the alternate lecture period being devoted to a study of the articles that have been written by the students. The student is required to hand in an assignment every two weeks. This is corrected and criticized from the editor's standpoint. This detailed, practical criticism does much to improve the writer's style. The lectures for this semester include the following

subjects: "The Growth of Journalism," "The Place of Agricultural Journalism," "Style," "Preparing and Submitting Articles," "A Study of the Agricultural Press," "The Importance of Brevity and Conciseness," "Publicity," "Agricultural Reporting," "Writing in the Form of Notes." Prerequisites, all the required courses in English. One hour credit.

2. **Advanced Journalism.** This is a continuation of Course 1, special emphasis being given to the development of originality and literary excellence. The work is taken up in much the same manner as in the previous semester. A large share of the matter written by the students in this course is accepted for publication in the leading agricultural papers. The lectures include: "History of Journalism," "The Development of Individuality," "The Selection of a Title," "The Value of Imagination," "Developing Originality," "Writing Feature Articles," "Writing for Special Issues," "Story Writing (from the standpoint of the agricultural papers)." During this semester several lectures are given to the class by men prominent in agricultural journalism. These lectures are invaluable in bringing the student into touch with the best agricultural papers and their needs. During the latter part of the semester a lecture is given by the Experiment Station Photographer, on "Photography in Its Relation to Journalism." Prerequisite, Journalism 1. One hour credit.

3. **Newspaper Management.** Courses 3 and 4 deal with actual management of an agricultural paper. They are taken up in connection with the student paper, the "Iowa Agriculturist." The Editor and Business Manager of this paper are elected by the Agricultural Club. In consultation with the Instructor in Agricultural Journalism, they choose a staff, which includes so far as possible all the students who wish to take the course in Newspaper Management. This staff meets once each week with the Instructor in Agricultural Journalism to talk over matters relating to the management of the paper. The following are among the subjects taken up: "Editing MS," "Copy Reading," "Proof Reading," "The Make-Up of an Agricultural Paper," "Writing Editorials," "Reviewing Books and Bulletins," "Agricultural Advertising," "The Work of the Circulation Manager," "The Preparation of Special Issues." The Instructor in Journalism makes no attempt to dictate the policy of the paper, all matters of that nature being left to the Editor and Business Manager. Prerequisite, Journalism 1. With the consent of the instructor, students may take Journalism 1 and 3 at the same time. One hour credit.

4. **Newspaper Management.** A continuation of course 3. Prerequisite, Journalism 1. One hour credit.

SUMMARY OF AGRICULTURAL COURSES.

Note—(The number before the parenthesis indicates the course number; the number in the parenthesis indicates the number of hours' credit.)

AGRONOMY COURSE.

Note—(The numbers after the hyphens indicate courses required of students taking one of the two special lines.)

	Hours Credit	
	Farm Crops Special Line	Soils Special Line
Agricultural Chemistry 21 (5), 23 (5), 25(4)	14	14
Agricultural Engineering 1 (1⅓), 2 (1⅓), 4 (3⅓), 5 (2⅔),	8⅔	8⅔
Animal Husbandry 1 (2), 2 (2), 3 (3⅓), 4 (3⅓), 20 (2) 21 (2)	14⅔	14⅔
Bacteriology 1 (4)	4	4
Botany 5 (3), 11 (4), 24 (1)	8	8
Dairying 12 (2⅔)	2⅔	2⅔
Economic Science 9 (3)	3	3
English 10 (3), 11 (3), 12 (2)	8	8
Farm Crops 1 (2⅔), 2 (2⅔), 3 (2), 4 (2), 8 (3), 17 (2)—9 (2), 10 (2), 15 (3), 19 (1), 20 (1)	23⅓	14⅓
History 19 (2)	2	2
Horticulture 2 (2⅔), 3 (2⅔), 4 (3), 14 (2⅔)	11	11
Library 1	R	R
Mathematics 17 (3)	3	3
Military 1, 2, 3 or Athletics, 4 or Athletics	R	R
Physics 205 (3)	3	3
Soils 1 (4), 2 (4), 6 (2), 8 (3),—3 (2), 4 (2), 11 (3), 17 (1), 18 (1)	13	22
Veterinary 56 (1)	1	1
Zoology 16 (5), - 4 (4)	9	9
Electives (See page —), (⅚), (9½)	10⅓	10⅓
Totals	138⅔	138⅔

	Hours Credit
DAIRYING COURSE.	
Agricultural Chemistry 21 (5), 23 (5), 25 (4), 26 (4), 40 (4)	22
Agricultural Engineering 1 (1⅓), 2 (1⅓), 7 (1⅔)	4⅓
Animal Husbandry 1 (2), 2 (2), 3 (3⅓), 4 (3⅓), 15 (1), 20 (2), 21 (2)	15⅔
Bacteriology 1 (4)	4
Botany 25 (2)	2
Dairying 11 (3), 12 (2⅔), 13 (1⅔), 14 (3⅓), 16 (1), 17 (4), 19 (2), 20 (3⅓), 21 (1⅔), 23 (2), 24 (2⅓), 26 (1), 27 (1), 28 (1)	30
Economic Science 9 (3)	3
English 10 (3), 11 (3), 12 (2)	8
Farm Crops 1 (2⅔), 2 (2⅔)	5⅓
History 19 (2)	2
Horticulture 2 (2⅔), 3 (2⅔), 14 (2⅔)	8
Library 1	R
Mathematics 17 (3)	3
Military 1, 2, 3 or Athletics, 4 or Athletics	R
Physics 205 (3)	3
Public Speaking 10 (2), 11 (2)	4
Veterinary 44 (2), 56 (1)	3
Electives (3⅔), (3⅔), (1), (8)	16⅓
Economics 10 or History 6 (3 hrs.)	3
Total	136⅓

ANIMAL HUSBANDRY COURSE.

	Hours Credit	
	Animal Husbandry Regular Line	Poultry Special Line
Agricultural Chemistry 21 (5), 23 (5), 25 (4), 26 (4)	18	18
Agricultural Engineering 1 (1⅓), 2 (1⅓), 4 (3⅓), 5 (2⅔)	8⅔	8⅔
Animal Husbandry 1 (2), 2 (2), 3 (3⅓), 4 (3⅓), 8 (2), 9 (2), 10 (2), 11 (2), 12 (2), 22 (1), 31 (2⅔), 37 (2⅔)		
Additional for Regular Students 6 (1⅓), 7 (2), 13 (1), 14 (1), 15 (1), 16 (1), 17 (1), 23 (1)	36⅓	
Additional for Poultry Students 30 (2⅔), 32 (1), 33 (1), 34 (1), 35 (1), 36 (1), 38 (1), 39 (1), 40 (1), 41 (2), 42 (2)		41⅔
Agricultural Journalism for Poultry Students 1 (1), 2 (1)		2
Bacteriology, for Poultry Students		4
Botany 26 (2)	2	2
Dairying 12 (2⅔)	2⅔	2⅔
Economic Science for Poultry Students 9 (3)		3
English 10 (3), 11 (3), 12 (2)	8	8
Farm Crops 1 (2⅔), 2 (2⅔)	5⅓	5⅓
History 19 (2)	2	2
Horticulture 2 (2⅔), 3 (2⅔), 14 (2⅔)	8	8
Library 1 (R)	R	R
Mathematics 17 (3)	3	3
Military 1, 2, 3 or Athletics, 4 or Athletics	R	R
Physics 205 (3)	3	3
Soils 1 (4), 2 (4)	8	8
Veterinary 18 (2), 23 (2), 44 (2), 56 (2)		7
Additional for Regular Students 16 (2), 19 (1), 55 (1⅓)	11⅓	
Zoology 2 (5), 3 (5), 5 (3), 6 (1), 8 (2)	16	16
Electives:		
For Regular Students (7⅚), (1½)	9⅓	
For Poultry Students (½)		½
Total	141⅔	142⅚

HORTICULTURE AND FORESTRY COURSE.

	Hours Credit	
	Horticulture Special Line	Forestry Special Line
Agricultural Chemistry 21 (5), 23 (5), 25 (4)	14	14
Agricultural Engineering 1 (1⅓), 2 (1⅓), 4 (3⅓), 8 (1)	7	7
Agricultural Journalism 1 (1)	1	1
Animal Husbandry 1 (2), 2 (2),	4	4
Bacteriology 1 (4)	4	4
Botany 11 (4), 15 (3)	7	7
For Special Horticultural Students 5 (3), 24 (1)	4	
For Forestry Students 5 (5)		5
Civil Engineering for Special Forestry Students 508 (4), 609 (4)		8
Dairying 12 (2⅔)	2⅔	2⅔
Economic Science 9 (3)	3	3
Economic Science 10 or History 6 (each 3 hrs.)	3	3
English 10 (3), 11 (3), 12 (2)	8	8
Farm Crops 1 (2⅔), 2 (2⅔)	5⅓	5⅓
Geology 10 (4)	4	4
History 19 (2)	2	2
Horticulture 1 (2⅔), 2 (2⅔), 7 (2), 8 (2), 9 (2), 13 (2), 14 (2⅔), 15 (2), 17 (1⅔), 19 (⅔), 28 (1), 29 (1), 31 (⅔)		
For Horticultural Students 4 (3), 5 (2⅔), 30 (⅔)	29⅓	
For Forestry Students 16 (2), 18 (2)		27
Library 1	R	R
Mathematics 17 (3)	3	3
Military 1, 2, 3 or Athletics, 4 or Athletics	R	R
Physics 205 (3)	3	3
Soils 1 (4), 2 (4), 13 (1⅔)	9⅔	9⅔
Veterinary 56 (1)	1	1
Zoology 4 (4), 16 (5)	9	9
Electives:		
For Horticultural Students (½), (4½), (2½), (4⅙)	11⅔	
For Forestry Students (2½), (2½), (2⅙)		7⅙
	—	—
Totals	135⅔	137⅚

AGRICULTURAL ENGINEERING COURSE.

	Hours Credit
Agricultural Chemistry 21 (5), 23 (5)	10
Agricultural Engineering 1 (1⅓), 2 (1⅓), 3 (1⅓), 4 (3⅓), 5 (2⅔), 6 (3), 7 (1⅔), 9 (2), 10 (2), 11 (3), 14 (1), 15 (1)	23⅓
Animal Husbandry 1 (2), 2 (2), 20 (2)	6
Civil Engineering 345 (2,) 653 (2), 446 (2)	6
Dairying 12 (2⅔)	2⅔
Economic Science 9 (3)	3
English 10 (3), 11 (3), 12 (2)	8
Farm Crops 1 (2⅔), 2 (2⅔), 8 (2⅔)	8
History 17 (1), 18 (1)	2
Horticulture 8 (2), 14 (2⅔), 20 (2), 31 (⅔)	7⅓
Library 1	R
Mathematics 20 (4), 21 (1), 22 (2), 23 (3), 24 (2), 25 (3), 26 (4)	19
Mechanical Engineering 181 (1), 220 (2), 322 (1), 401 (3), 502 (5), 512 (1), 533 (2), 606 (5), 613 (1), 714 (1)	22
Military 1, 2, 3 or Athletics, 4 or Athletics	R
Physics 303 (5), 404 (5)	10
Soils 1 (4), 2 (4)	8
Veterinary 44 (2)	2
Electives (1⅚), (6⅚)	8⅔
Total	146

SCIENCE AND AGRICULTURE COURSE.

Agricultural Chemistry 21 (5), 23 (5), 25 (4), 26 (4)	18
Animal Husbandry 1 (2), 2 (2)	4
Bacteriology 1 (4)	4
Botany 5 (3), 11 (4), 15 (3)	10
Economic Science 9 (3)	3
English 10 (3), 11 (3), 12 (2)	8
Farm Crops 1 (2⅔), 2 (2⅔), 4 (2)	7⅓
Geology 10 (4)	4
History 4 (3), 19 (2)	5
Horticulture 2 (2⅔), 3 (2⅔), 15 (2), 19 (⅔)	8
Literature 4 (3)	3
Mathematics 17 (3)	3
Military 1, 2, 3 or Athletics, 4 or Athletics	R
Physics 205 (3)	3
Soils 1 (4), 2 (4)	8
Zoology 4 (4), 16 (5)	9
Electives:	
Choice { Group I (23) and electives (4), (4), (11) Group II (28) and electives (2), (1), (2), (9) }	42

		Hours Credit
Group I:		
Economic Science 16 (3)	3	
Civics 11 (2), 12 (2)	4	
History 20 (2), 21 (2)	4	
Psychology 5 (3), 6 (3), 7 (3), 8 (3)	12	
	—	
Group II:		
Major and supporting line (7), (7), (7), (7). Total, 28.		
Total		139½

ELECTIVES IN THE AGRICULTURAL COURSES.

Subjects which may be elected in the Junior or Senior Year in any of the Agricultural courses, provided the student has the prerequisites for each study chosen:

Semester.	Department. Course Numbers, and Hours.
First	Agricultural Chemistry 27 (3), 40 (4).
Second	Agricultural Chemistry 26 (4), 34 (5), 56 (5).
First	Agricultural Engineering 3 (3⅓), 4 (3⅓), 7 (1⅔), 9 (2), 13 (2).
Second	Agricultural Engineering 5 (2⅔), 6 (3), 8 (1), 9 (2), 13 (2).
First	Agricultural Journalism 1(1), 3 (1).
Second	Agricultural Journalism 2 (1), 4 (1).
First	Animal Husbandry 9 (2), 11 (2), 20 (2), 21 (2), 30 (2⅔), 31 (2⅔), 32 (1), 35 (1), 38 (1), 41 (2).
Second	Animal Husbandry 7 (2), 12 (2), 33 (1), 34 (1), 36 (1), 39 (1), 42 (2).
First	Bacteriology 1 (4).
Second	Bacteriology 1 (4), 5 (4).
First	Botany 4 (5), 5 (3 or 5), 13 (2), 19 (2), 60 (2).
Second	Botany 11 (4), 12 (4), 15 (3), 23 (1 to 5), 25 (2), 36 (4).
First	Civil Engineering 308 (4).
Second	Civil Engineering 409 (4), 713 (2).
First	Dairying 14 (3⅓), 17 (4), 26 (1).
Second	Dairying 11 (3), 13 (1⅔), 16 (1), 20 (3⅓), 21 (1⅔), 24 (2⅓), 25 (3), 27 (1).
First	Economic Science 1 (5), 3 (3), 7 (2), 9 (3), 13 (1), 17 (2), 19 (2), 22 (3).
Second	Economic Science 4 (2), 5 (3), 6 (2), 10 (3), 11 (2), 20 (1), 21 (2).
First	English 7 (1), 13 (2).
Second	English 8 (1).

First	Farm Crops 3 (2), 8 (3), 10 (2), 11 (2), 17 (2).
Second	Farm Crops 4 (2), 10 (2), 12 (1⅓), 18 (5).
First	Geology 704 (4), 10 (4).
Second	Geology 607 (4), 805 (4), 2 (4), 6 (4), 9 (2).
First	History 3 (3), 5 (3), 10 (2), 12 (2).
Second	History 4 (3), 5 (3), 6 (3), 9 (2), 11 (2), 20 (2), 21 (2).
First	Horticulture 1 (2⅔), 4 (3), 5 (2⅔), 8 (2), 9 (2), 18 (2), 19 (⅔), 21 (2), 30 (⅔).
Second	Horticulture 7 (2), 15 (2), 16 (2), 17 (1⅔), 31 (⅔), 32 (⅔).
First	Modern Languages: Language (French) 1 (5), 3 (3). Language (German) 5 (5), 16 (3). Language (Spanish) 30 (5).
Second	Modern Languages: Language (French) 2 (5), 4 (3). Language (German) 6 (5), 17 (3). Language (Spanish) 31 (5).
First	Literature 1 (3), 4 (3), 6 (2), 8 (2).
Second	Literature 2 (5), 3 (3), 7 (2), 10 (3), 11 (2), 13 (2), 14 (2).
First	Mathematics 8 (5), 24 (2), 25 (3).
Second	Mathematics 9 (5), 23 (3), 26 (4).
First	Military 5 (1), 7 (1).
Second	Military 6 (1), 8 (1).
First	Physics 509 (2).
Second	Physics 404 (5)
First	Psychology 5 (3), 6 (2), 7 (3), 9 (2).
Second	Psychology 2 (3), 3 (3), 4 (3), 5 (3), 6 (3), 8 (3), 9 (2).
First	Public Speaking 3 (2), 5 (2), 10 (2), 16 (2), 17 (1).
Second	Public Speaking 4 (2), 6 (2), 8 (1), 11 (2), 18 (1).
First	Soils 1 (3⅓), 4 (2), 6 (2), 8 (3), 13 (1⅔).
Second	Soils 2 (3⅓), 3 (2), 7 (1), 14 (3), 15 (2), 16 (2).
First	Veterinary 19 (1), 23 (2), 33 (3), 44 (2).
Second	Veterinary 22 (2), 24 (2).
First	Zoology 2 (5), 4 (4), 5 (3 or 5), 10 (3 or 5), 18 (2).
Second	Zoology 3 (5), 6 (1), 8 (2), 10 (3 or 5), 17 (3).

Remunerative and Instructive Labor.

The Agricultural Courses afford opportunity to do considerable work in the fields and about the barns and grounds. The compensation for services of this kind ranges from eight to fifteen cents per hour according to the merit of the work. Thus students are enabled not only to earn part of their expenses but also to materially strengthen the practical side of their education. A number of the strongest and most capable students are aided in finding employment during vacations with successful stockmen on good farms and in various other positions in line with their chosen work. Some who have taken a year of practical work in this way during their course have found it of marked benefit, and it has enabled them to command more desirable and remunerative positions at the completion of their College course. Too much emphasis cannot be placed on a thorough understanding of the practical application of correct principles of agriculture.

Credits for Practical Work.

Agricultural students who, by previous agreement with the head of the department, do practical work on farms, horticultural or feeding or breeding establishments, beet sugar factories or forestry reservations, of recognized standing, during their course of study will be allowed credits on the following basis: Students who take practical work of the kind described under the direction of the proprietor and render competent and faithful service, will, on their return to College and on the presentation of a concise written report or resume of their observations and experience, be entitled to the following credits in the four-year courses in Agriculture:

For three months, five hours of elective work in the Junior or Senior year; for six months, eight hours; and for one year, ten hours; no more than five hours of which shall be credited in any one term of the College course.

Students must have at least six months of practical work before graduation, but credit will be given for such work only as stated above.

Department of Agriculture Scholarships.

The State Department of Agriculture offers scholarship prizes of $200.00, $100.00 and $25.00, open to young men of the state not enrolled as regular or special students in any agricultural college, without barring the students of the special short courses in January. These scholarship prizes are awarded for the best judging live stock and corn annually at the state fair in accordance with the rules and conditions prescribed by the state department of agriculture governing the contest. These afford opportunities for young men to receive substantial aid toward paying the expenses of a college education, and some excellent students have come to the institution by means of these scholarships.

Mr. J. Ogden Armour, of Chicago, and the Rosenbaum Live Stock Commission Company, of Chicago, have donated prizes of $5,000 and $1,000 respectively for competition annually at the International Live Stock Exposition. At the last International the Iowa State College won seven of Armour scholarships of $250 each. These scholarships are awarded annually to worthy students enrolled in the two weeks' short courses and in the regular four-year courses.

Agricultural Experiment Station

Agricultural Experiment Station

CHARLES FRANKLIN CURTISS, DIRECTOR.

WILLARD JOHN KENNEDY, VICE-DIRECTOR.

The investigations of the Experiment Station are intimately related to the College work of instruction, as the problems occupying the attention of the Station are those that have a material bearing on the profit of the farm, and they are also those that are timely and in need of accurate investigation. Whether relating to the field, the feed lot or the laboratory, the aim is to investigate those questions which will have a practical relation to successful agriculture. Originality is made a feature of the work so far as is consistent with useful results, and in all instances the sole object is to throw light on the truth relating to the various principles and practices of the farm. The field work strongly supports the instruction of the College in regard to the varieties of grains and the methods of cultivation, thus enabling the student to become acquainted with the latest ideas relating to these. Tests are made of different varieties of fodders, grasses and grains, also of different systems of culture and various crops.

The experimental investigations with animals embrace a study of the value of different feeds for different features of animal production, the preparation of feeds, systems of feeding, also a study of different types of animals suitable for the requirements of the market. The object sought in this department of Station work is to indicate the manner in which the Iowa farmer, through the employment of animals, can realize the most from his farm products and add to the fertility of the farm. The Experiment Station has reached out in this way to a remarkable degree, bringing sheep from Mexico, Colorado and Scotland; cattle from Texas and Great Britain; horses from Wyoming, Montana and Europe, in its endeavor to thoroughly study this very important feature of the farmer's work. The data from these experiments is always accessible to the student who has the opportunity of observing daily the development of it at every stage.

The work of the Experiment Station is in the closest touch with the Dairy industry. The problems which practical men are constantly confronting and asking aid in solving are at all times objects of experimentation by the Dairy Section. The students not only see, but assist in carrying out these experiments. In this way they become acquainted not only with the problems to be solved, but with the methods employed in the investigations. This experimental work relates to the various problems of both butter and cheesemaking. The results of this work, together with those of the bacteriological investigations, are daily used in class work.

The experimental work in Horticulture also affords the student an opportunity to study the results of the theory of the class room as practiced in the field. The connection of the Department of Horticulture with the State Horticultural Society is such that problems touching the commercial side of fruit growing receive the closest attention. Experiments are conducted in spraying for the prevention of fungous pests and injurious insects; also in fertilizing, pruning, and thinning; in nursery work and in plant breeding. The Station work thus equips the student with the practice and technique necessary to a thorough horticultural training.

The work of the Experiment Station has been increased by the addition of Forestry as a line of investigation. Methods of practical treatment of fence posts and other timbers to increase durability are being determined in co-operation with the United States Forest Service and farmers and stockmen throughout the state. The adaptability of various trees for different sections of the state and methods of germination and storage are being tested. To get more definite data in reference to germination of seed and growth of seedlings in nursery rows, tree seed has been distributed to farmers in twenty-five counties of the state.

A 200-acre dairy farm is stocked and equipped for experimental and educational work in this important line of work. This farm and its equipment afford excellent facilities for experimental work in the farm production side of the dairy industry. A poultry department has also been added for experimental and instruction work.

Agricultural Extension Department

Agricultural Extension Department

PERRY GREELEY HOLDEN, SUPERINTENDENT.

The Agricultural Extension work was established permanently by enactment of the Thirty-first General Assembly of Iowa. This act provided for giving lectures and demonstrations on the growing of crops and fruits, on stock raising, dairying, land drainage and kindred subjects, including Domestic Science. Specific mention was made in this act of instruction in corn and stock judging at agricultural fairs, institutes and clubs and aid in conducting Short Courses of instruction at suitable places throughout the state. Under this act the Extension Department has been organized as a department of the Division of Agriculture.

The demand for the extension work was the natural outgrowth of the experimental and instruction work which has been carried on at the College by the heads of the departments in the Division of Agriculture. It was deemed best to separate it from the instruction and experimental work of the College and employ a special staff for extension work, to avoid interference with the duties of the heads of departments in conducting the College work. There is necessarily a close relation between all of the heads of departments and the extension work in corresponding lines. The Extension Department sustains the same relation to the Division of Agriculture and to the College as a whole, as the other agricultural departments, though this work is confined entirely to instruction and demonstrations given in various parts of the state remote from the College, with the exception of such assistance as members of that staff have rendered in connection with the two weeks' Short Course held annually at the College in January.

The extension work has met with general favor and been in wide demand. Demonstration work was conducted by members of the staff at meetings within the state, other than Short Courses, to the number of 844, outside the state to the number of 60. During the year Short Courses have been held at Sheldon, New Providence, Elkhorn, Fairfield, Mount Pleasant, Pella, Newton, Avoca, Mason City, Cedar Rapids, Spencer, Storm Lake, Correctionville, Manchester, Waterloo and Marshalltown. Special Domestic Economy Courses, in addition to the regular Short Courses, were held at Creston, Boone, Dallas Center, Denison, Cherokee, Clarinda, Leon and Sibley. The total enrollment for Short Courses not held at the College was 5,633.

Division of Veterinary Medicine

Division of Veterinary Medicine

CHARLES HENRY STANGE, DEAN AND PROFESSOR.

RALPH R. DYKSTRA, PROFESSOR.

WILLIAM WALLACE DIMOCK, ASSOCIATE PROFESSOR.

HAROLD EDWARD BEMIS, ASSISTANT PROFESSOR.

HOWARD SYLVESTER MURPHEY, ASSISTANT PROFESSOR.

GEORGE JUDISCH, LECTURER.

The Division of Veterinary Medicine offers a four-year course of nine months each. The former curriculum has been revised and enlarged and a course in stock judging and animal nutrition from the department of Animal Husbandry added. This new and longer course has met with general approval as is shown by the increased attendance in face of the advanced entrance requirements and increased length of course of study. The Freshman Year has been made sufficiently light to enable students who have a few back credits to take some additional work. During the Senior Year opportunity will be given to take some special work in Bacteriology, Pathology, or do some individual research work. The new building will afford special facilities for this kind of work.

The new Hall of Veterinary Medicine, the erection of which will begin this year, is to be 144 feet by 176 feet, three stories in height, and with a large interior court for clinical purposes. The basement will contain mortuary, crematory, post-mortem rooms, etc. The first floor will be devoted to the Dean's office, assembly room, waiting room, library, pharmacy, operating room, clinic room, stock room, and the department of Surgery. The back part will be taken up with stalls for patients. The second floor will be occupied by the department of Anatomy, consisting of two large dissecting rooms, bone room, class room and offices. The laboratories and offices of the department of Histology and Pathology will occupy the second floor in the front part of the building, while the department of Practice and the House Surgeon's quarters will occupy the east wing. The departments of Physiology and Pharmacology, with laboratories will occupy the third floor. New and modern equipment will be installed throughout.

The faculty has been materially strengthened and the student is provided with the best of opportunity to do efficient work.

The present Veterinary hospital is a three story brick building, fitted with well-lighted single and box stalls, operating rooms, office and pharmacy, resident surgeon's room, dissecting room, etc., and is furnished with all the surgical instruments of modern construction, operating table and other important conveniences for hospital work.

A number of fine grass paddocks directly adjacent to the hospital are used for such patients as are likely to be benefited by outdoor exercise and a grass diet in the season.

The Veterinary Hospital and the daily free clinics furnish an abundance of material for practical work. Situated in an extensive stock-growing district, the College is especially favored in this respect, not only horses, but all species of animals, being brought to the hospital for treatment. Senior students are assigned cases for diagnosis and treatment under the supervision of the clinical professor, thus having an opportunity to apply the theoretical knowledge obtained in the class room. During the course opportunity is offered to witness all the different operations performed in veterinary surgery, together with the methods of treating the different internal diseases. Junior students are detailed in alphabetical order to assist the pharmacist in the compounding of prescriptions, in this way becoming familiar with the various forms in which medicines are administered.

Specially equipped laboratories afford excellent opportunity for the study of anatomy, pharmacy, bacteriology, histology, pathology, and the related sciences.

A laboratory intended for the purpose of bacteriological and pathological investigation of the diseases of domestic animals has been equipped as a part of the Experiment Station. It is supplied with the most modern biological apparatus, such as high power microscopes, incubators, hot air and steam sterilizers, microtomes, stains, gas, water and electric light, and in fact all first-class facilities for scientific investigation. Specimens are received frequently for examination.

Students also have the advantages of a very extensive library, where access may be had at all times to such journals, magazines, experiment station bulletins, and other literature as they may desire for reference in their study.

Aside from the facilities which belong especially to the Veterinary Division, the equipment for instruction in Animal Husbandry, consisting of large flocks and herds of carefully-selected breeds of live stock, helps to render practical instruction very efficient. This department is regarded as one of the strongest in the country if not in the world and the most perfect types of the different breeds are used for class work. In this way the work in Veterinary medicine is linked with that in agriculture which proves of inestimable value to Veterinarians.

The work in Botany, Chemistry, Zoology, and other related sciences is adequately provided for in the special buildings for the accommodation of these several departments of college work. In this way each line of work is presented to the student by a specialist in his particular line of work.

Examinations and Degree.

Examinations are held at the close of each semester upon the work passed over during that semester. At the end of each year the final examinations are held. Students must have passed examinations in all prerequisite work of a given semester or year before they can proceed with the work of the succeeding semester or year. These examinations are controlled by the faculty rules. At the close of the course after passing a satisfactory examination, the student receives the degree of Doctor of Veterinary Medicine (D. V. M.).

Candidates for graduation must be twenty-one years of age, of good character, and must have passed examinations in all the required subjects in the course.

Field Open to Qualified Veterinarians.

The student having completed the course of instruction outlined in this curriculum becomes a veterinarian in the broadest sense, and competent to enter a wide field of usefulness by any of the avenues enumerated.

A.—General Practice.—In view of the fact that the national live stock valuation is estimated at $3,200,000, it becomes obvious that the graduate possessing fitness and aptitude for this kind of work will meet with a ready demand and substantial compensation for his services.

B.—Bureau of Animal Industry.—Veterinarians are in demand for inspection work in the Bureau of Animal Industry, United States Department of Agriculture, at salaries ranging from $1,400.00 to $2,500.00.

C.—Army.—The Veterinarians in the United States Army now have a position similar to that of a commissioned officer. The salary is $1,500.00 per year with a 10 per cent increase for each five years' service up to twenty years, with the same allowances as a second lieutenant of cavalry.

These positions are most desirable, and with our insular possessions give opportunities for wide experience in professional work.

D.—Animal Husbandry.—Qualified veterinarians are called upon to act as counsel to the breeder and as guardians to the vast live stock industry of the nation.

E.—Municipal and State Veterinarians.

F.—Veterinarians to stock farms and corporation stables.

G.—Veterinarians to Experiment Stations and Instructors in Veterinary Colleges.

COURSE IN VETERINARY MEDICINE.

Freshman Year.

FIRST SEMESTER.

Veterinary 1	Comparative Anatomy,	3
Veterinary 6	Dissection,	2⅔
Veterinary 33	Histology, (One laboratory period)	3
Botany 9	Structural Botany, (One laboratory period)	3
Chemistry 1	Elementary Inorganic Chem-	

	istry, (One laboratory period)	3
Animal Husbandry 1	Market Types of Cattle and Sheep (Two laboratory periods)	2
Military 1	Military Drill	
		Total, 16⅔ hours

SECOND SEMESTER.

Veterinary 2	Comparative Anatomy,	3
Veterinary 7	Dissection,	2⅔
Veterinary 22	Comparative Physiology,	2
Veterinary 34	Histology, (One laboratory period)	3
Botany 16	Poisonous Plants, (One laboratory period)	2
Chemistry 4	General Chemistry, (One laboratory period)	3
Animal Husbandry 2	Market Types of Dairy Cattle, Horses and Swine	2
Military 2	Military Drill	
		Total, 17⅔ hours

Sophomore Year.

THIRD SEMESTER.

Veterinary 3	Comparative Anatomy,	3
Veterinary 8	Dissection,	2⅓
Veterinary 23	Comparative Physiology,	2
Veterinary 25	Pharmacy, (One laboratory period)	2⅔
Veterinary 35	General Pathology, (One laboratory period)	3
Zoology 15	General and Vertebrate Zoology, (Two laboratory periods)	5
Chemistry 10	Elementary Organic Chemistry,	2
Military 3	Military Drill, or Athletics	
		Total, 20 hours

FOURTH SEMESTER.

Veterinary 4	Comparative Anatomy,	3
Veterinary 9	Dissection,	2⅓
Veterinary 24	Comparative Physiology,	2
Veterinary 27	Materia Medica,	2
Veterinary 36	General Pathology, (One laboratory period)	3
Veterinary 54	Physical Diagnosis,	2

Veterinary 16	Horse Shoeing,	2
Chemistry 13	Physiological Chemistry, (One laboratory period)	3
Military 4	Military Drill, or Athletics	
	Total,	19⅓ hours

Junior Year.

FIFTH SEMESTER.

Veterinary 40	Theory and Practice of Medicine,	3
Veterinary 10	Principles and Practice of Surgery,	3
Veterinary 37	Special Pathology, (One laboratory period)	2⅔
Veterinary 30	Therapeutics,	2
Veterinary 50	Clinics,	4
Zoology 5	Embryology, (One laboratory period)	3
Bacteriology 10	Bacteriology, (One laboratory period)	2⅔
	Total,	20⅓ hours

SIXTH SEMESTER.

Veterinary 41	Theory and Practice of Medicine,	3
Veterinary 11	Principles and Practice of Surgery,	3
Veterinary 38	Special Pathology, (One laboratory period)	2⅔
Veterinary 51	Clinics	4
Veterinary 31	Therapeutics,	2
Bacteriology 11	Bacteriology (One laboratory period)	1⅔
Zoology 8	Animal Parasites, (One laboratory period)	3
Dairying 13	Milk Testing and Milk Inspection, (One laboratory period)	1⅔
	Total,	21 hours

Senior Year.

SEVENTH SEMESTER.

Veterinary 42	Theory and Practice of Medicine,	3
Veterinary 12	Principles and Practice of Surgery,	3
Veterinary 48	Jurisprudence,	1

Veterinary 52	Clinics	4	
Veterinary 14	Operative Surgery,	1	
Veterinary 44	Sanitary Science,	2	
Veterinary 19	Obstetrics,	1	
Veterinary 39	Meat Inspection,	2	
Animal Husbandry 20	Animal Feeding,	2	
	Total,	19	hours

EIGHTH SEMESTER.

Veterinary 43	Theory and Practice of Medicine,	3	
Veterinary 13	Principles and Practice of Surgery,	3	
Veterinary 53	Clinics,	4	
Veterinary 15	Operative Surgery,	1	
Veterinary 45	Sanitary Science,	2	
Veterinary 20	Obstetrics,	1	
Veterinary 47	Hippology,	2	
Veterinary 18	Conformation and Soundness,	2	
Animal Husbandry 8	Animal Breeding,	2	
	Total,	20	hours

COURSES IN VETERINARY MEDICINE.

Comparative Anatomy.

DR. DYKSTRA.

1, 2, 3 and 4. **Comparative Anatomy.** Each three lectures per week.

6, 7, 8 and 9. **Dissection.** Each eight hours per week. Two and two-thirds hours' credit.

The courses in Comparative Anatomy include both Descriptive and Comparative Anatomy. Descriptive Anatomy includes the study of bones, articulations, muscles, circulatory apparatus, and special sense organs. This work is given by lectures supplemented by demonstrations from mounted skeletons, prepared specimens, charts and an Auzoux clastic model.

Practical Anatomy includes a course in dissection. During each year the student makes two complete dissections of the horse and such parts of other animals as is deemed necessary. The first year's work is devoted to the study of bones, articulations and muscles; the second, to special dissection of the nervous system, circulatory apparatus, lymphatic glands, organs of special sense and the organs contained in the abdominal and thoracic cavities. Each student must properly dissect and pass an examination on the part assigned before starting the dissection and study of another part.

Principles and Practice of Surgery.

DR. BEMIS.

10, 11, 12 and 13. **Principles and Practice of Surgery.** Each three lectures per week.

General Surgery includes Surgical bacteriology, the pathology and treatment of inflammation, diseases of the bones, nerves, muscles, articulations, tendons, tendon sheaths and bursae; methods of amputation and ex-articulation, suturing and the general treatment of wounds; methods of anaesthesia; intravenous, and sub-cutaneous injections; castration; methods of restraint in securing animals, and methods of actual cautery.

Special Surgery includes the surgical diseases of the head, neck, thorax, abdomen, urino-genital organs, fore-limb, hind-limb, vertebrae, pelvis, stomach and bowels.

Operative Surgery.

14 and 15. **Operative Surgery.** Students perform all the operations necessary in veterinary practice. Each three hours per week. One hour's credit for each course. Fee, $10.00.

Horse Shoeing.

16. **Horse Shoeing.** Study of anatomy and physiology of foot, relation between form of foot and direction of limb, variation in flight of limb, style of going, shoeing of normal and irregular feet, winter shoeing, hoof nurture, correction of defects in gait, and the methods of shoeing hoofs defective in form or diseased. Two lectures per week.

Conformation and Soundness.

18. **Conformation and Soundness.** Study of conformation of horse with special reference to defects which exist and predispose to pathological changes causing unsoundness, comparison of normal and diseased parts, and a systematic classification arranged to conform to parts involved. Lectures and practical demonstration upon the animal. Two lectures per week.

Obstetrics.

DR. DYKSTRA.

19. **Obstetrics.** Consists of physiological obstetrics; ovulation, oestrum, fecundation, sterility, gestation, and hygiene of pregnant animals, and parturition. Prerequisite, Zoology 5. One lecture per week.

20. **Obstetrics.** Consists of pathological obstetrics; the diseases and accidents of pregnancy, dystokia, obstetrical operations, the sequelae of parturition, and the diseases of the young animal. One lecture per week.

Comparative Physiology.

DR. MURPHEY.

22. **Comparative Physiology.** A study of general physiology, dealing with the animal cell, the unit of organization, its origin, modifica-

tion of form and structure, chemical constitution and the various chemical and physical laws which affect its nutrition, growth, reproduction and development. Two lectures per week.

23. **Comparative Physiology.** Deals with special functions of various organs and tissues of the body. Two lectures per week.

24. **Comparative Physiology.** Continuation of Course 23. Lectures, two hours per week.

Physiology is taught by comparing vital phenomena of domestic animals with those of human beings. In all these courses, F. Smith's Manual of Veterinary Physiology is used as a text.

Pharmacy.

MR. JUDISCH.

25. **Pharmacy.** A study of all official drugs and preparations. Special attention is paid to practical pharmaceutical problems and manipulations, also to the principles and practical work in compounding prescriptions. Each student is required to prepare at least one of each class of official preparation. Credit, two and two-thirds hours. Lectures, two hours, and laboratory, two hours per week. Fee, $2.00.

Materia Medica.

MR. JUDISCH.

27. **Materia Medica.** This course is introduced by definitions and a discussion of composition of drugs, classifications of official preparation, incompatibilities and classification of all drugs employed in the practice of Veterinary Therapeutics. Following this, each drug is taken up in order of its classification and discussed in general detail. Lectures, two hours per week.

Therapeutics.

DR. STANGE.

30. **Therapeutics.** Same classification of drugs is used as in Course 27. A study of modes of action of drugs, the physiological laws governing the same, the absorption, elimination and methods of administration, dosage, idiosyncrasy; also the physiological and therapeutic actions, indications and contra-indications, toxicology and treatment, modes of administration and dose of each therapeutic agent. Two lectures per week.

31. **Therapeutics.** Continuation of Course 30. Reference, Winslow's "Veterinary Materia Medica and Therapeutics" and other standard works. Two lectures per week.

Histology.

DR. BEMIS.

Histology proper is preceded by a short course in Microscopy. This is designed to give the student a working knowledge of the microscope and microscopical methods, thus fitting him to study, to best advantage, the minute structure of tissues and organs.

33. **Histology.** Treats of the cell as a unit of structure, of its functions, the tissues, their classification and characteristics. Credit, three hours. Recitations, two hours, and laboratory, three hours, per week. Fee, $2.00.

34. **Histology.** Treats of the tissues in their relation to the structure of organs. Credit, three hours. Recitations, two hours, and laboratory, three hours, per week.

Pathology.

DR. DIMOCK.

35. **General Pathology.** Treats of causes of disease, its spread and generalization, protecting and healing forces, disturbances of circulation, retrograde disturbances of nutrition, and infiltration, hypertrophy and regeneration, inflammation and tumors; also the methods of preparation and preservation of gross specimens, preparation of sections for microscopic study, general technique of laboratory diagnosis. The student is then given preparations for the study of the various pathological phenomena as considered in class room. Recitations, two hours, and laboratory, three hours, per week. Fee, $2.00.

36. **General Pathology.** Continuation of Course 35. Recitations, two hours, and laboratory, three hours, per week.

37. **Special Pathology.** Treats of the etiology and morbid anatomy of diseases caused by streptococci, bacilli, higher fungi, protozoa, animal parasites, and those infectious diseases, the specific cause of which is not yet determined. Two and two-thirds hours' credit. Recitations, two hours, and laboratory, two hours, per week. Fee, $2.00.

38. **Special Pathology.** Continuation of Course 37. Two and two-thirds hours' credit. Recitations, two hours, and laboratory, two hours, per week. Fee, $2.00.

Meat Inspection.

DR. MURPHEY.

39. **Meat Inspection.** Includes the physical characteristics of normal flesh and organs; methods of slaughter; principles of refrigeration and preservation; effect of accidental and pathological conditions on the preservation and edibility of meats; putrefaction of meats and consequences of ingestion of such meats by man; effects upon the meat of various constitutional and infectious diseases; transmissibility of disease to man and effects of cooking on transmissibility; and the meat inspection laws of the United States. Two lectures per week.

Theory and Practice of Veterinary Medicine.

DR. STANGE.

40. **Theory and Practice of Veterinary Medicine.** Includes work on congestion, inflammation and fever, diseases of the respiratory system, circulatory system, blood and lymph, digestive apparatus, nervous

system, genito-urinary system, eye and skin, and the non-infectious constitutional diseases. Three lectures per week supplemented by practice in daily clinics.

41. **Theory and Practice of Veterinary Medicine.** Continuation of Course 40. Three lectures per week.

42. **Theory and Practice of Veterinary Medicine.** Continuation of Courses 40 and 41. Three lectures per week.

43. **Theory and Practice of Veterinary Medicine.** Devoted to history, etiology, symptoms, lesions, differential diagnosis and treatment of the various diseases caused by animal parasites; also a review of the morphological and cultural characteristics of the specific organisms in connection with the symptoms and lesions which they produce. Three lectures per week.

Sanitary Science.

DR. MURPHEY.

44. **Sanitary Science.** Consists of a consideration of health and disease; the etiology of disease, predisposing and exciting; means and manner of propagation and transmission of infectious diseases; general hygiene and stable sanitation, including ventilation, drainage, selection of site and materials for construction. Two lectures per week.

45. **Sanitary Science.** A consideration of practical methods of disinfection, disinfecting agents both chemical and physical, methods of dipping and dips, principles of serum therapy, vaccination and quarantine; also sanitary police of the individual infectious and parasitic animal diseases. Two lectures per week.

Hippology.

47. **Hippology.** How to maintain the health and strength of the horse, including the framework of the horse from a mechanical standpoint, bits and bitting, saddling, draft and harness; care of animals in garrison and in field, including watering, feeding and grooming. Two lectures per week.

Jurisprudence.

DR. STANGE.

48. **Jurisprudence.** Consists of a study of rights and duties of the veterinary practitioner and of the owner of domestic animals; contracts and sales as applied to dealings in live stock; and the subject of expert testimony. One lecture per week.

Clinics.

DRS. STANGE AND BEMIS.

50, 51, 52, and 53. **Clinics.** The practical work afforded by the clinics gives the student an opportunity to put his knowledge into practice and to acquire the aptitude requisite for his professional work. Free clinics are held at the hospital every day from 1 to 3 o'clock p. m. The cases brought to the hospital for treatment are assigned to the senior students who are required to prepare a full report of their examination, diagnosis, and proposed treatment, which are then graded by the clinician when he examines the case. The hospital cases are also treated and reported on by the senior students. The clinical professor, when examining a case, performing an operation, or administering internal treatment, discusses the various aspects of the case, thus giving the utmost good to the student. The junior students assist the seniors in their clinical and hospital work. The large number of animals of all species brought to the hospital afford the student an opportunity to acquire a familiarity with their treatment such as will enable them to give good service to clients immediately upon entrance into practice. Four hours per week during each semester.

Physical Diagnosis.

DR. STANGE.

54. **Physical Diagnosis.** Arts and methods of diagnosis first considered, then general examination of different apparatuses of the animal body, and finally specific examinations, including experimental inoculations as a means of diagnosis. Two lectures per week.

Anatomy of Domestic Animals.

DR. DYKSTRA.

55. **Anatomy of Domestic Animals.** One and one-third hours' credit.

56. **Anatomy of Domestic Animals.** One hour credit.

TEXT AND REFERENCE BOOKS.

Dictionary.—Dorland and Gould.

Anatomy.—Chauveau's "Anatomy of the Domesticated Animals," McFadyean's "Comparative Anatomy," Strangeway's "Veterinary Anatomy," McFadyean's "Dissection Guide," Schmaltz's "Atlas der Anatomie de Pferdes."

Physiology.—F. Smith's "A Manual of Veterinary Physiology," "American Text Book of Physiology."

Histology.—Szymonowiez-MacCullum. Böhm-Davidoff-Huber. Stöhr's.

Materia Medica.—"United States Dispensatory."

Pharmacy.—Remington's "Practice of Pharmacy."

Chemistry.—Bennett's "General Chemistry and Qualitative Analysis," Remsen's "Organic Chemistry," Bunge's "Physiological Chemistry."

Botany.—Atkinson's "Elementary Botany."

Therapeutics.—Winslow's "Veterinary Materia Medica and Therapeutics," "Arzneimittellehre für Tierärzte," by Fröhner, Veterinary Medicine, Dun.

General Pathology.—McFarland, Zeigler, Stengel. Comparative General Pathology, by Kitt.

Special Pathology.—Moore, Hayes' Translation of "Infective Diseases of Animals," by Friedberger and Fröhner. Specielle Pathologie und Therapie der Haustiere by Hutyra and Marck.

Zoology.—Comstock and Kellogg's "Elements of Insect Anatomy," for beginners; none for advanced work.

Bacteriology.—Muir and Ritchie's "Manual of Bacteriology."

Animal Husbandry.—Craig's "Judging Live Stock."

Surgery.—Dollar's. Volume I., Operative Technique.
Dollar's Volume II., General Surgery.
Dollar's. Volume III., Regional Surgery.
William's Surgical Operations.

Practice.—Law's "Veterinary Medicine," Hayes' "Translation of Infective Diseases of Animals," by Friedberger and Fröhner, Malkmus; "Clinical Diagnostics;" "Diseases of Dog," Glass.

Animal Husbandry.—Shaw's "Animal Breeding."

Animal Breeding.—Davenport's.

Embryology.—Foster and Balfour's "The Elements of Embryology." "An Introduction of Vertebrate Zoology," A. M. Reese.

Horseshoeing.—"A Text Book of Horseshoeing," by Lungwitz, translated by Adams. "Handbook of Horseshoeing," by Dollar.

Medicine.—Law's "Veterinary Medicine," Hayes' Translation of "Infective Diseases of Animals," by Friedberger and Fröhner.

Milk Inspection.—Farrington and Woll.

Obstetrics.—Fleming's "Veterinary Obstetrics," Bourney, "Obstetrique Veterinaire," Dalrymple's "Veterinary Obstetrics," De Bruin's "Bovine Obstetrics," translated by Wyman.

Animal Nutrition.—Jordan's "The Feeding of Animals," Henry's "Feeds and Feeding," Armsby's "Principles of Nutrition."

Conformation and Soundness.—Goubaux and Barrier's "Exterior of the Horse," translated by Harger; Hayes' "Points of the Horse."

Meat Inspection.—Ostertag's "Meat Inspection," Robertson and Herzog's "Meat and Food Inspection."

Division of Engineering

Division of Engineering

ANSON MARSTON, DEAN, PROFESSOR, CIVIL ENGINEERING.

SAMUEL WALKER BEYER, VICE-DEAN, PROFESSOR, MINING ENGINEERING AND GEOLOGY.

LOUIS BEVIER SPINNEY, PROFESSOR, PHYSICS AND ILLUMINATING ENGINEERING.

WARREN H. MEEKER, PROFESSOR, MECHANICAL ENGINEERING.

FRED ALAN FISH, PROFESSOR, ELECTRICAL ENGINEERING.

The work of the Division of Engineering of the college is apportioned among five departments, viz.:

The Department of Mechanical Engineering.
The Department of Civil Engineering.
The Department of Physics and Illuminating Engineering.
The Department of Electrical Engineering.
The Department of Mining Engineering and Ceramics.

Through these departments the College offers systematic four year and five year courses in Mechanical Engineering, Civil Engineering, Electrical Engineering, and Mining Engineering, a four year course in Ceramics, and two year courses in Mining Engineering and Clay Working.

NEW FIVE YEAR ENGINEERING COURSES OF STUDY.

The engineering graduates of the Iowa State College have now come to occupy so many positions of responsibility that there has come from them a strong demand for longer and broader training of part of the engineering students for executive and other positions of large responsibility than can be given by the four year courses of study, such as are standard in the principal engineering schools of the country.

The fact is that in the marvelous advance of civilization in recent years the place of the engineer has become continually more important, and more and more responsibilities of the widest character are placed upon him. To furnish opportunity for the training of such men, new five year engineering courses of study have been established, and all engineering students who can afford the necessary time and expense are urged to take this course in preference to the four year course.

NEW COURSE IN CERAMICS.

At the instance of the Iowa Brick and Tile Manufacturers' Association, and of the Association of Iowa Cement Users, the legislature recently passed a law establishing instruction and experimentation along these lines at the State College.

In obedience to the law a four year course of study in Ceramics has been established, and the proper facilities for instruction and experimentation in the lines of cement and clay products have been provided, including the construction of a new building exclusively for this work.

Iowa has great undeveloped resources in these lines which offer an inviting and remunerative field for professional work. We already have more calls for graduates to take remunerative positions in the cement and clay industries than we can possibly supply. The work in Ceramics leads to opportunity not only for securing salaried position, but also for ultimate management and ownership of important manufacturing industries.

DEPARTMENT OF PHYSICS AND ILLUMINATING ENGINEERING.

During the past year the Department of Physics and Electrical Engineering was divided into two departments, i. e., Electrical Engineering and Physics and Illuminating Engineering.

Illuminating Engineering has become so important that it has been necessary to introduce some special instruction along this line. Students in the Electrical, Civil and Mechanical Engineering Courses are offered the option of taking work along this line in their Senior year.

THE ENGINEERING COURSES.

The several courses are planned with a view to fitting those pursuing them to enter professional engineering work and to advance therein more rapidly than would be possible without the preparation furnished by a college course. Experience shows that the graduates from technical schools generally excel in their chosen lines, and it is worthy of note in this connection that railroads, manufacturers and other corporations, as well as municipalities and government departments, are demanding that those who seek promotion in their technical departments shall have secured a technical training such as can now be obtained in the engineering schools of the country.

It is very manifest, because of the lack of time in the course, the multiplicity of general subjects which must be emphasized and the lack of uniformity of details in the profession due to the local and personal differences which exist in the conduct of engineering work of all kinds that no college course in engineering can give to a student training and experience in all the details of his profession. Moreover it seldom happens that a student in college knows definitely what specific branch of his chosen profession he will follow, and it would be folly for him to spend his time on details which he may never use. A thorough education in the branches of pure and applied science which are related to professional work is essential. Having this, the engineer readily acquires familiarity with the details of his work. Without it no amount of experience with details alone can give an engineer high rank in his profession.

Therefore it is believed that a college course in engineering should be, in the first place, a training of the mind of the student toward ability to think logically, to observe accurately, and by the application of the former acquirement to the latter to reach correct inferences; in the second place, such a course should acquaint the student with approved methods of draughting and computing, with the use and limits of the instruments employed in the everyday work of his profession, and should give him an opportunity for experimental work bearing upon engineering problems; in the third place, such a course should provide that the student acquire the art of expressing himself, publicly and privately, in good English and should furnish him with some knowledge of the history of his own and preceding times, thus equipping him to be an ornament to his profession, and an enlightened member of society.

In accordance with the views above expressed the engineering courses of this college include a variety of studies. These may be conveniently grouped as culture studies, training or disciplinary studies, professional studies, and practical work.

The culture studies include History, English, English Literature, Modern Language, Economic Science and Civics. Thorough work in English is especially necessary in the training of the engineer to enable him to express himself with the utmost clearness and conciseness, in his reports and in papers on technical subjects. No one can attain great success as an engineer who fails in these particulars. His success in carrying out projects upon which he is engaged will often depend upon his ability to convince his superiors or public officials of the correctness of his views. The really successful engineer must also come in close contact with other members of his profession, and must exchange information of value with them through the medium of papers on technical subjects. For the attainment of these ends the engineer should give especial attention to the thoroughness of his training in English. Modern Language, either French, German, or Spanish, not only gives access to the technical foreign literature, but also aids the work in English. History, Economic Science, and Civics cultivate interest in mankind at large and are thus broadening to the student.

The training studies include two or more years of Mathematics and a thorough course in Physics, the very backbone of engineering and of the training of the engineer, because by their study are secured habits of logical thinking and a knowledge of the fundamental principles of matter—the laws of nature; also one or more years' work in Chemistry where the habits of observing and recording facts are thoroughly instilled.

Considerable time in the Junior and Senior Years is given by all engineering students to work having practical bearing on their profession; the object being to correlate, in some measure, theory and practice.

Draughting, shop work and field work are begun upon entrance and continued in proper proportions throughout the several courses. By this means students are frequently able to obtain valuable practical experience during their vacations and are thereby, in turn, benefited by being able to see the usefulness of their college work more clearly than before.

By such vacation work the student is placed in a measure, in the position of the so-called practical engineer, who, if he be honest with himself, wishes for the advantages of a technical education.

In the professional studies the student, through his teachers, text books, and actual practice, gets into touch with the problems which the engineers of the day are trying to solve, and thus learns to appreciate the difficulties which confront them.

The professional and practical studies culminate in the graduation thesis in which the student is expected to show energy, determination, resourcefulness and discrimination in the solving of a problem whose solution will add something to the store of engineering knowledge.

A certain amount of undergraduate work and a large amount of graduate work as well as the research work carried on by the individual members of the engineering faculty is devoted to the various industrial interests of the state.

Advanced students are given an opportunity to assist in all research or commercial work which is being conducted by the engineering departments.

IMPROVEMENT OF ENGINEERING COURSES.

Thorough revision and improvement of the engineering courses have recently been completed. Many improvements and advances have been introduced, which will have the effect of still further advancing the standards of the engineering courses. Constant effort is being made to improve the courses, and they are kept revised in accordance with the progress of engineering education.

FIVE YEAR ENGINEERING COURSES OF STUDY.

The new five year engineering courses of study, already referred to, have been in effect for one year. As compared with the four year courses of study, they contain a much larger amount of general culture subjects, much wider opportunity for choice of electives, and some advanced engineering subjects.

The added culture work includes advanced English, advanced History, and nine to twenty-six hours of elective work. This considerable amount of electives will permit of the selection for each student of general and scientific subjects of such a nature as will be best suited to his particular needs.

In addition, there will be opportunity in the advanced courses for the pursuit of advanced engineering work along lines selected by each student.

These five year courses will be of great benefit to those who can pursue them, combining much of the advantages of a general college training with very thorough technical instruction. It is generally admitted that the ideal training for the engineer would be a complete general college course plus a complete engineering course, but the time and expense of the two courses places such ideal training beyond the reach of practically all. The five year courses will be found to be within the reach of every student, even those who must earn the money to pay their own way through college, and all students are urged to take them.

The five year courses are now arranged so that students already pursuing the four year courses can do the additional year of work, should they so elect, at any time while they are in college.

Demand for I. S. C. Engineering Graduates.

The engineering graduates of the College are scattered in remunerative and most responsible positions over the entire world. The demand for them is, in normal times, constantly greater than the supply. Many of the seniors are engaged long anterior to commencement.

The graduates are scattered from Panama to Alaska, and from New York to the Philippines, with large representation at the principal centers of engineering work. Their representation at such centers is so large that I. S. C. Alumni Associations are numerous throughout the United States and on both coasts of the same, and one exists even in the Philippine Islands.

The George W. Catt Engineering Library.

A signal example of the loyalty to the College of its engineering graduates has been presented in the bequests to the College by Mr. George W. Catt, C. E., '82, who was President of the Atlantic, Gulf and Pacific Dredging Company, and who, on his death, bequeathed to his Alma Mater his extensive engineering and economic libraries and one-half of his large fortune.

The engineering library has been placed in Engineering Hall, in conjunction with the engineering books and periodicals from the general college library, and thus through Mr. Catt's devotion, the engineering students are afforded free access to the best engineering literature. Extensive use of these library privileges is strongly urged on all engineering students. Only by extensive technical reading, especially of the current periodicals, can one become a worthy member of the engineering profession.

Buildings and Equipment.

The buildings occupied exclusively by the Division of Engineering are the Engineering Hall, the Engineering Annex, the Structural and

Hydraulic Laboratory, the Power Station, the Foundry, the Pattern Shop, the Locomotive Laboratory, the Forge Shop, the Machine Shop, and the Ceramics Building.

COURSES IN ENGINEERING.

The following general courses are given by the Dean, Vice-Dean and the Professor of Mechanical Engineering, and are included in the courses of study in each of the engineering departments:

603. **Conservation of our Natural Resources.** The course embraces a study of ways and means not only of preventing unnecessary destruction of our natural resources by unwise use, but also of preventing waste of our natural resources from disuse. Incidentally, an inventory of our natural resources is compiled during the progress of the work. Lecture, one hour per week.

702. **Specifications and Contracts.** Principles of engineering contract law, business methods, specifications for engineering construction. One recitation or lecture per week.

801. **History of Engineering.** The early development of engineering, as traced from history and from the remains of ancient works; development of engineering in later periods and its growth into a separate profession; the effect on civilization, general history and economic problems of the several inventions and other improvements which have marked the development of engineering; study of lives of more famous engineers; also the development of the general technical principles of engineering. One hour per week.

Department of Mechanical Engineering

WARREN H. MEEKER, PROFESSOR.

MARK PERKINS CLEGHORN, CHARLES CURTIS MAJOR, ASSOCIATE PROFESSORS.

ROY A. NORMAN, ROY HIRAM PORTER, ROY EVERETT ROUDEBUSH, ASSISTANT PROFESSORS.

EZRA C. POTTER, JESSE GREENLEAF HUMMEL, EDWARD MERRITT SPANGLER, JOSEPH B. VARELA, JOHN THAXTER BATES, JAMES WILLIAM CAMERON, JOHN A. SAWIN, JOHN HUG, N. LEERBURG, INSTRUCTORS.

The headquarters of this department are in Engineering Hall. The principal offices are on the second floor. On this floor are a lecture room and a combination class and drawing room. On the first floor are two rooms devoted to research work in mechanical engineering. On the fourth floor are two drafting rooms accommodating 160 students at one time, fitted with combination drawing tables, instrument cabinets and boards, whereby 480 students can be assigned to mechanical drawing and designing in the department. In conjunction with these rooms is a commodious office for the instructing staff in drawing. In addition the department has a common interest in and use of photographic room, a blue print room on the fourth floor, the engineering museum, and faculty room on the third floor and the assembly room on the second floor.

The draughting, class and lecture rooms are equipped with ample blackboard space and the offices are fitted with convenient furniture for efficient and accurate administration of the interests of the department.

In addition to the above space in the new Engineering Hall, the department occupies the Engineering Laboratory, the Power House, the Machine Shop, Forge, Foundry, the Pattern Shops, and the Locomotive Laboratory.

In the Engineering Laboratory the hydraulic laboratory is used conjointly with the Department of Civil Engineering, the first, second, and third floors are used for general engineering laboratory work.

Shop Work.

Students in mechanical engineering pursue the full course in shop work, which consists of six hours per week for three and one-half years. Partial courses are given to students in mining and electrical engineering.

The system of instruction in the several shops begins with graded exercises calculated to familiarize the student with tools and with the materials used. The exercises are supplanted as soon as possible by work on machines or parts thereof which are to be put into actual use. By this arrangement greater interest is maintained in the work than would be possible with a strict adherence to the exercise system. The object of the shop work is not to teach trades, but to acquaint the student with the tools, materials and difficulties of shop practice and to establish in the mind principles which will aid him in designing and construction work, in the other studies of his course and in his professional career.

The Machine Shop is a new brick building 150 feet long by 45 feet wide and has a main floor and gallery. At one end of the main floor are located locker room, reading room and office. The tool room is placed near the middle of the shop with room inclosed in the gallery above for small stores.

The Machine Shop is equipped with a twenty-four by twenty-four-inch planer, a milling machine, a universal grinding machine, a shaper, a drill press, two emery grinders, a polishing wheel, a power hack saw, a cutting off machine, thirteen engine lathes of capacities from ten to twenty-inch swing and three to ten feet between centers, and three speed and drilling lathes together with usual assortment of small tools in the tool room. Power is furnished to this shop by an electric motor.

The Pattern Shop is a brick building one story high with spacious attic for storage of lumber. The building is one hundred and twenty feet long by forty feet wide. A tool room twelve by twenty feet is screened off in the center. A fireproof room is provided for patterns. The equipment of the pattern shop consists of a universal buzz saw, a mortising machine, planer, buzz planer, band saw, jig saw, grindstone, fifteen turning lathes, benches for thirty students, thirty complete sets of small tools and a number of special tools. Power for this building is furnished by a twenty horsepower electric motor.

The foundry equipment is housed in a brick building eighty by forty feet. A steel truss roof structure of substantial construction provides support for an overhead traveling crane, which serves the whole floor for handling heavy ladles and castings. A cupola and blower for melting cast iron, a brass furnace, a core oven, core benches, twenty-four sets of moulder's tools, crucibles, and a large assortment of flasks are used for foundry work.

The Forge Shop is housed in a new brick building 38x78 feet, with a store room. Thirty forges, an oil burning annealing and tempering furnace, donated by the Rockwell Engineering Company, with blower and exhaust fan, drill press, vises, anvils, grindstone and small tools, such as sledges, fullers and swages, constitute the equipment for forge work.

Electric motors supply power for the forge and foundry.

Students are advised to work in outside shops during their vacations. Credit is frequently given on work required in the regular course for such commercial experience.

Drawing.

The regular drawing room work of the course begins with Mechanical Drawing given in the first semester of the Freshman year. This is followed successively by projective drawing, machine sketching and detailing, kinematic drawing, and designing. The last two years of the course are given up to designing.

The object sought by the drawing room course is to enable the student to make, as quickly as possible, neat and accurate working drawings, to design, in general and in detail, machines or parts thereof, and to apply throughout his knowledge of shop methods and his theoretical information acquired in the laboratory and class room.

The two large drawing rooms on the fourth floor of Engineering Hall and a part of the combination drawing and class room on the second floor of the same building are equipped with fifty combination drawing tables, each accommodating four students at once. The drawing boards are placed in frames adjustable as to height and angle and equipped with parallel rulers. Each unit has twelve drawers which are assigned to students for their drawings, instruments and supplies. Extra drawing boards are supplied so that each place can be used by more than one student at different periods.

An extensive collection of blue prints, photographs, drawings, and trade catalogues, as well as machines and parts thereof, constitute an important part of the working equipment in this branch of the work.

Experimental Engineering.

Experimental work begins with the Junior year and extends to the end of the course. The instruction in this work is thorough, its scope being indicated by the following list of experiments:

Tensile, transverse, torsion and compression tests of materials, properties of lubricants, measurements of power by absorption and transmission dynamometers, steam gauge and indicator spring calibration, flue gas analysis, indicator practice, variation of engine speed, fan-blower tests, calorimetry, including throttling and separating calorimeters, weir and water meter calibration, efficiency tests of steam engines, boilers, gas producer and engine, injectors, and steam heating, electric lighting, refrigerating, power and pumping plants, and thermal analysis of the steam engine, coal calorimetry, besides a number of special experiments in the line of investigation. Tests on power plants outside of the College are made as frequently as possible. The engineering laboratory work usually culminates in the thesis, which is an exhaustive investigation of a limited subject. From four to five hundred hours of actual time are spent on theses by students in the engineering courses.

The old and new power houses contain the complete electric light and power and pumping plants of the College, all of which are available for experimental work, and constitute a part of the engineering laboratory equipment of the engineering department of the College. In the power houses are a 51-H. P. Babcock & Wilcox boiler, two 264-H. P. Cahall horizontal water tube boilers, with Roney mechanical stokers with induced draught, two 260-H. P. Sterling boilers with special furnaces and induced draught, a 250-H. P. Corliss engine direct connected to 150 K. W. generator, a 75-H. P. Straight Line engine, a 50-H. P. Ball engine, with five dynamos for alternating and direct current from 15 to 60 kilowatt capacity. In addition to the above, the engineering laboratory equipment of the department consists of a 50-H. P. Fairbanks, Morse & Co.'s suction gas producer and engine equipped with absorption brake, a 25-H. P. Harris Corliss engine with Alden absorption brake, a 12-H. P. Otto gasoline engine, an Ericsson Hot Air Engine, a Wheeler condenser, three Worthington and three other water meters, two Venturi meters, a Pelton water motor, a Holly duplex pump, a Morris Machine Works centrifugal pump, injectors, weir and weighing tanks, gas meters, a Crosby steam gauge tester, fan blowers for experimental work, Westinghouse and New York air pumps, a 100,000-pound Riehle testing machine with Gray autographic device, a 50,000-pound Olsen testing machine, and Olsen torsion testing machine, a Doolittle viscosimeter, a Thurston oil tester, a complete De La Vergne refrigerating machine, gas and air analysis apparatus, anemometers, two Thompson, five Crosby, two Star, and one Richards indicators, dynamometers, a Prony brake, Parr coal calorimeter, platform scales and other apparatus essential and accessory to experimental engineering.

The Hydraulic Laboratory is supplied with about 700 feet of 8-inch and 10-inch cast iron pipe from the College elevated tank, of 163,000 gallons capacity. The available head is about 150 feet. In the laboratory a tank is provided 50 feet long by 6 feet wide by 4 feet deep, which is used as a measuring and discharging tank for various pieces of apparatus, and which can also be used for experiments on the resistance of models to propulsion. The water is removed from this tank by two sewers; one 6 inches and the other 15 inches in diameter. These are arranged to be used for experiments on the laws of flow in sewer pipes. The laboratory is also provided with pipes of different sizes so arranged that measurements of the friction losses in these pipes and in their fittings can be made. Additional apparatus in the nature of hydraulic motors, pumps of various types, and apparatus for experiments with orifices is being provided.

Locomotive. The Chicago & Northwestern railway has presented to the department an eight-wheel passenger locomotive and tender complete with attachments. The locomotive will be mounted for experimental work and will be a valuable addition to the laboratory equipment.

The principal dimensions of the locomotive are as follows:
Cylinder, 16x24 inches.
Drivers, diameter, 63 inches.
Driving wheel base, 7 feet, 3 inches.
Total engine wheel base, 21 feet, 3 inches.
Total engine and tender wheel base, 42 feet, 3 inches.
Total weight of engine, 70,000 pounds.
Weight on drivers, 40,000 pounds.

The estate of S. H. Mallory, of Chariton, Iowa, has presented a narrow gauge locomotive, one of the first in service on the mountain roads of Colorado. The valve mechanism is of the Waelschert type and the drivers and leading wheels are on a truck with cylinders entirely separate from the boilers.

This engine is a very interesting machine and will be the nucleus for a museum of railway mechanical engineering.

Class Room Work.

In the class room the work is carried on by means of recitations and lectures, a text book and recitation being used wherever practicable; it is necessary, however, to present much material not found in text books, and in such cases recourse is had to the lecture system. The projective lantern is freely used in illustrating subjects presented by lecture.

Inspection Trips.

Once each year or oftener visits of inspection are made by the Senior class to power and manufacturing plants in Chicago and other large centers.

Non-Resident Lecturers.

Lectures by men in active engineering work are introduced from time to time and serve to add interest to the College work by bringing students and teachers in contact with the professional engineer and the problems of modern engineering.

Thesis.

So far as possible the graduating thesis is directed along lines which will produce results directly useful to the industrial interests of the State of Iowa, but this object is not furthered to the detriment of the student to whom the thesis must be first of all an opportunity to think for himself and to apply principles previously inculcated in the regular course of his studies.

Fees.

All students taking the shop work or engineering laboratory are required to pay a fee to defray the cost of materials, power, and breakage. The amount is specified in the description of the courses of study.

Mechanical Engineering at Ames and Throughout the State.

It is the desire of the department to be of all possible service to owners and operators of power stations for heat, light and power, of machine shops and of manufacturing plants in all lines.

To this end correspondence is invited relating to problems on mechanical engineering lines and whenever inquiries by letter or in person indicate a need for investigation demanding the technical skill and equipment of the department the same will be undertaken if possible and the results furnished to all interested.

COURSES IN MECHANICAL ENGINEERING.

Four Year Course in Mechanical Engineering.

This course leads to the degree of Bachelor of Science in Mechanical Engineering. Graduates from this course may receive the full professional degree of Mechanical Engineer by devoting one year to resident study and one year to a responsible engineering position and presentation of a satisfactory thesis, or by five years' service in responsible engineering work and presentation of thesis.

N. B. Engineering Course numbers. The number in hundreds place indicates the semester in which the subject is taught. If the subject is also taught in a previous semester, the true course number is followed by the descriptive course number in parenthesis.

*Freshman Year.

FIRST SEMESTER.

		Required Semester hours
Mathematics 20,	Algebra	4
Mathematics 21,	Plane Trigonometry	1
Modern Languages		

Language selected must be carried through the entire year.

Choice	Language 18 or 57	French	3	3
	Language 20 or 5a	German	3	
	Language 36 or 33	Spanish	3	
	Literature 15	English	3	

Students will be assigned to Modern Language courses under the following rules:

I. Students with four credits in modern language:

1. Should continue the same language by taking Course 18, 36 or 20.

2. May take French 57 or Spanish 33, provided that satisfactory reasons for the change are presented to the Dean of the Junior College and the head of the Modern Language Department.

II. Students entering with two credits in German and two in Latin, will take German 5a.

III. Students entering with four credits in Latin may take English Literature 15, French 57 or Spanish 33.

English 10,	Narration and Description	3
Chemistry 41,	General Chemistry	3
Mechanical Engineering 130,	Shop Work	2
Mechanical Engineering 117,	Technical Lecture	
Mechanical Engineering 121,	Mechanical Drawing	2
Military 1,	Military Drill	
	Total semester hours	18

*Freshmen who show deficient preparation in English or Mathematics may be assigned by the Dean of the Junior College and the Dean of Engineering, to special classes, with one hour more work than indicated above, and in case of clear indication of failure in either of these subjects, even with this arrangement, they will be dropped from the Freshman work in this line until they have given proof of sufficient preparation to enable them to carry the work successfully.

SECOND SEMESTER.

		Required Semester hours
Mathematics 22,	Trigonometry	2
Mathematics 23,	Analytical Geometry	3
Modern Languages		

Language selected must be a continuation of the one chosen in first semester.

Choice	Language 19 or 58	French	3	3
	Language 21 or 6a	German	3	
	Language 37 or 34	Spanish	3	
	Literature 16	English	3	

English 11,	Exposition	3
Chemistry 42,	General Chemistry	3
Mechanical Engineering 232,	Shop Work	2
Mechanical Engineering 218,	Technical Lecture	
Mechanical Engineering 220,	Descriptive Geometry	2

Military 2,	Military Drill	
	Total semester hours	18

Sophomore Year.

THIRD SEMESTER.

		Required Semester hours
Mathematics 24,	Analytical Geometry	2
Mathematics 25	Calculus	3
English 12,	Argumentation	2
Chemistry 43,	Qualitative Chemistry	3
Physics 303,	Mechanics and Heat	5
Mechanical Engineering 331,	Shop Work	2
Mechanical Engineering 322,	Mechanical Drawing	1
Military 3, or Athletics,		
	Total semester hours	18
History 17,	The American People	1

To be taken in Sophomore or Junior year.

FOURTH SEMESTER.

		Required Semester hours
Mathematics 26,	Differential and Integral Calculus	4
Chemistry 45,	Analytical Chemistry	2
Physics 404,	Electricity and Magnetism and Light and Sound	5
Mechanical Engineering 401,	Analytical Mechanics	3
Mechanical Engineering 437,	Shop Work	1
Mechanical Engineering 439,	Shop Work	1
Mechanical Engineering 423,	Mechanical Drawing	2
Military 4, or Athletics,		
	Total semester hours	18
History 18,	American Statesmen	1

To be taken in Sophomore or Junior year.

Junior Year.

FIFTH SEMESTER.

		Required Semester hours
Mechanical Engineering 502,	Analytical Mechanics	5
Mechanical Engineering 503,	Materials of Construction	3
Mechanical Engineering 541,	Descriptive Engineering	2
Physics 506,	Electricity and Magnetism	3
Mechanical Engineering 524,	Valve Gear Design	1

Mechanical Engineering 512,	Mechanical Engineering Laboratory	1
Mechanical Engineering 533,	Shop Work	2
Physics 523,	Physical Laboratory	1
	Total semester hours	18

SIXTH SEMESTER.

		Required Semester hours
Mechanical Engineering 606,	Analytical Mechanics	5
Mechanical Engineering 605,	Machine Design	3
Engineering 603,	Conservation of Natural Resources	1
Mechanical Engineering 642,	Descriptive Engineering	1
Electrical Engineering 610,	Direct Current Machinery	3
Mechanical Engineering 625,	Designing	1
Mechanical Engineering 634,	Shop Work	2
Mechanical Engineering 613,	Mechanical Engineering Laboratory	1
Physics 615,	Physical Laboratory	1
	Total semester hours	18

Optional:

Students obtaining approval of the head of the department may classify, during any semester of the Junior or Senior years, in two hours of optional, technical or culture work.

Senior Year.

SEVENTH SEMESTER.

		Required Semester hours
Engineering 702,	Specifications and Contracts	1
Mechanical Engineering 704,	Heat Engines	3
Mechanical Engineering 708,	Railway Mechanical Engineering	3
Mechanical Engineering 707,	Heating and Ventilation	2
Economic Science 9,	Outlines of Economics	3
Mechanical Engineering 726,	Designing	2
Mechanical Engineering 735,	Shop Work	2
Mechanical Engineering 714,	Mechanical Engineering Laboratory	1
Electrical Engineering 717,	Electrical Engineering Laboratory	1
Mechanical Engineering 743,	Mechanical Engineering Seminar	
Mechanical Engineering,	Thesis begun	
	Total semester hours	18

EIGHTH SEMESTER.

			Required Semester hours
Engineering 801,	History of Engineering		1
Mechanical Engineering 809,	Constructive Engineering		3
Electrical Engineering 815,	Alternating Current Machinery		3
Mechanical Engineering 827,	Designing		3
Mechanical Engineering 811,	Thesis		4
Choice Civil Engineering 855,	Water Supply Engineering	2	3
Mechanical Engineering 815,	Mech. Eng. Laboratory	1	
Physics 801,	Illuminating Engineering	3	
Electrical Engineering 818,	Electrical Engineering Laboratory		1
Mechanical Engineering 844,	Mechanical Engineering Seminar		
	Total semester hours		18

Optional:

Students obtaining approval of the head of the department may classify, during any semester of the Junior or Senior years, in two hours of optional, technical or culture work.

Five Year Course in Mechanical Engineering.

The following five-year course in Mechanical Engineering is offered in response to a demand for an engineering course giving the student a better education in the culture studies and the natural sciences together with an opportunity to specialize along certain engineering lines not possible in the time available in the four-year course of study. The course includes all of the work given in the four-year course and in addition twenty-four hours of culture and scientific studies, together with ten hours of work given in the engineering departments.

This course leads to the same degree granted to graduates of the four-year course, but a graduate may obtain the full professional degree of Mechanical Engineer after one year of responsible professional work and the presentation of a satisfactory thesis.

N. B. Engineering Course Numbers.—The number in hundreds place indicates the semester in which the subject is taught. If the subject is also taught in a previous semester, the true course number is followed by the descriptive course number in parenthesis.

Freshman Year.

FIRST SEMESTER.

Mathematics 20	Algebra	4
Mathematics 21	Plane Trigonometry	1
Modern Language		

Language selected must be carried through the entire year.

Choice	Language 18 or 57	French	3	3
	Language 20 or 5a	German	3	
	Language 36 or 33	Spanish	3	
	Literature 15	English	3	

Students will be assigned to Modern Language courses under the following rules:

I. Students with four credits in modern language:

1. Should continue the same language by taking Course 18, 36 or 20.

2. May take French 57 or Spanish 33, provided that satisfactory reasons for the change are presented to the Dean of the Junior College and the head of the Modern Language Department.

II. Students entering with two credits in German and two in Latin, will take German 5a.

III. Students entering with four credits in Latin may take Literature 15, French 57 or Spanish 33.

English 10	Narration and Description	3
History 6	French Revolution and XIXth Century	3
Mechanical Engineering 121	Mechanical Drawing	2
Mechanical Engineering 130	Forge Work	2
Mechanical Engineering 117	Technical Lecture	
Military 1	Drill	
		18

SECOND SEMESTER.

Mathematics 22	Trigonometry	2
Mathematics 23	Analytical Geometry	3
Modern Language		

Language selected must be a continuation of the one chosen in the first semester.

Choice	Language 19 or 58,	French	3	3
	Language 21 or 6a,	German	3	
	Language 37 or 34,	Spanish	3	
	Literature 16	English	3	

English 11	Exposition	3
History 4	Division and Reunion, 1850 to 1879	3
Mechanical Engineering 220	Descriptive Geometry	2
Mechanical Engineering 232	Shop Work	2
Mechanical Engineering 218	Technical Lecture	
Military 2	Drill	
		18

Sophomore Year.

THIRD SEMESTER.

Mathematics 24	Analytical Geometry	2
Mathematics 25	Calculus	3
English 12	Argumentation	2
Chemistry 2	General Chemistry	5
Mechanical Engineering 322	Mechanical Drawing	1
Mechanical Engineering 331	Shop Work	2
History 17	The American People	1
Elective:	Non-technical work	2
Military 3, or Athletics		
		18

FOURTH SEMESTER.

Mathematics 26	Differential and Integral Calculus	4
Chemistry 5	Qualitative Analysis	5
Mechanical Engineering 423	Mechanical Drawing	2
Mechanical Engineering 437	Shop Work	1
Mechanical Engineering 439	Shop Work	1
History 18	American Statesmen	1
Elective:	Non-technical work	4
Military 4, or Athletics		
		18

Junior Year.

FIFTH SEMESTER.

Physics 503 (303)	Mechanics and Heat	5
Mechanical Engineering 503	Materials of Construction	3
Economic Science 9	Outlines of Economics	3
Civil Engineering 545 (345)	Surveying	2
Mechanical Engineering 533	Machine work	2
Mechanical Engineering 524	Valve Gear Design	1
Mechanical Engineering 541	Descriptive Engineering	2
		18

SIXTH SEMESTER.

Physics 604 (404)	Electricity and Magnetism, Light and Sound	5
Mechanical Engineering 601 (401)	Analytical Mechanics	3
Economic Science 12	Engineering Economics	3
Civil Engineering 646 (446)	Surveying	2
Mechanical Engineering 634	Shop work	2
Mechanical Engineering 642	Descriptive Engineering	1
Elective:	Non-technical work	2
		18

Senior Year.

SEVENTH SEMESTER.

Mechanical Engineering 702 (502)	Analytical Mechanics.	5
Physics 706 (506)	Electricity and Magnetism	3
Mechanical Engineering 707	Heating and Ventilating	2
Physics 723 (523)	Physical Laboratory	1
Mechanical Engineering 712 (512)	M. E. Laboratory	1
Mechanical Engineering 735	Shop work	2
Mechanical Engineering 726	Designing	2
Elective:	Non-technical work	2
		18

EIGHTH SEMESTER.

Engineering 803 (603)	Conservation of Natural Resources	1
Mechanical Engineering 806 (606)	Analytical Mechanics	5
Mechanical Engineering 805 (605)	Machine Design	3
Electrical Engineering 810 (610)	Direct Current Machinery	3
Physics 815 (615)	Physical Laboratory	1
Mechanical Engineering 813 (613)	M. E. Laboratory	1
Mechanical Engineering 825 (625)	Designing	1
Physics 801	Illuminating Engineering	3
		18

Post-Senior Year.

NINTH SEMESTER.

Engineering 902 (702)	Specifications and Contracts	1
Mechanical Engineering 904 (704)	Heat Engines	3
Mechanical Engineering 908 (708)	Railway Mechanical Engineering	3
Civil Engineering 921 (721)	Sanitary Engineering	3
Mechanical Engineering 914 (714)	M. E. Laboratory	1
Electrical Engineering 920 (720)	E. E. Laboratory	2
Mechanical Engineering	Thesis begun	
Elective:		5
		18

TENTH SEMESTER.

Engineering 1001 (801)	History of Engineering	1
Mechanical Engineering 1009 (809)	Constructive Engineering	3
Civil Engineering 1055 (855)	Water Supply Engineering	2
Electrical Engineering 1015 (815)	Alternating Current Machinery	3
Electrical Engineering 1018 (818)	E. E. Laboratory	1
Mechanical Engineering 1027 (827)	Designing	3
Mechanical Engineering 1015 (815)	M. E. Laboratory	1
Mechanical Engineering 1011 (811)	Thesis	4
		18

COURSES IN MECHANICAL ENGINEERING.

N. B. Engineering Course Numbers. The number or letter in hundreds place indicates the semester in which the subject is taught.

117. Technical Lecture. Study of elementary principles of construction and operation of steam engines, boilers and accessory apparatus. One lecture per week.

121. Mechanical Drawing. Use of drawing instruments, practice in lettering, and making working drawings. Two hours' credit. Six hours per week.

130. Shop Work. Forge work, forging and welding iron and steel, and dressing and tempering tools. Two hours' credit. Six hours per week. Fee, $5.00.

181. Mechanical Drawing. The use of drawing instruments, making of working drawings. One hour credit. Three hours per week.

218. Technical Lecture. Course in connection with required shop work. Study of shop methods, tools and appliances. Three lectures of this course are given by college librarian on explanation of the catalogue system and the use of reference books. One lecture per week.

220. Descriptive Geometry. Study of the principles of projection of the point, line, and plane, the basis of all mechanical drawing. The principles are illustrated and fixed in mind by the solution of numerous familiar examples to show the practical application of the subject. Prerequisites, 121 and 181. Two hours' credit. Five hours' drawing and one lecture per week.

232. Shop Work. Foundry Work, molding in green and dry sand

and cores, casting in iron, brass, mixtures and alloys. Two hours' credit. Six hours per week. Fee, $5.00.

322. **Mechanical Drawing.** Machine Sketching and Detailing. Prerequisites, courses 121 and 220. One hour credit. Three hours per week.

331. **Shop Work.** Pattern work, principles of Joinery, Wood Turning and Carving as applied to the making of simple patterns and core boxes for iron, brass and aluminum castings. Two hours' credit. Six hours per week. Fee, $5.00.

401. **Analytical Mechanics.** Statics, graphics and strength of materials. Text book, Mechanics of Engineering, Church. Prerequisite, Mathematics 25. Three recitations per week.

423. **Mechanical Drawing.** Working drawings, tracings, blue prints of complete machines and their details. Prerequisite, Course 322. Two hours' credit. Six hours per week.

437. **Shop Work.** Advanced pattern making, gearing, sweep and molding machine work. One hour credit. Three hours per week. Fee, $2.00.

439. **Shop Work.** Steam fitting and plumbing, cutting and making up threaded, flanged and leaded joints with standard fittings. One hour credit. Three hours per week. Fee, $3.00.

483. **Mechanical Drawing.** Of same character as course 423. Prerequisite, 322. One hour credit. Three hours per week.

502. **Analytical Mechanics.** Flexure and dynamics. Text book same as in course 401, which is a prerequisite. Recitations, five hours per week.

503. **Materials of Construction.** Manufacture, properties, and uses of iron, steel, wood, cement, etc. Text book, Materials of Construction, Johnson. Prerequisite, Chemistry 5 or 45. Recitations, three hours per week.

512. **Laboratory.** Properties of materials, calibration of instruments, valve setting, indicator practice and efficiency tests of simple machines. Reference book, Experimental Engineering, Carpenter. Prerequisites, 401 and Chemistry 5 and 42. One hour credit. One-half day per week. Fee, $3.00.

524. **Valve Gear Design.** Kinematics and valve gear design. One hour credit. Three hours' drafting and lecture per week.

533. **Shop Work.** Use of hand and machine tools for working iron, steel and brass, finishing and assembling of machines and parts thereof. Prerequisite, course 130. Two hours' credit. Six hours per week. Fee, $5.00.

541. **Descriptive Engineering.** Study and written reports on engineering processes, methods and current engineering construction. References; magazines, journals and proceedings of engineering societies. Two hours per week.

605. Machine Design. Elements of Machine Design. Text book, Machine Design, Smith and Marx. Prerequisites, courses 502, 503 and 512. Recitations, three hours per week.

606. Analytical Mechanics. Work, energy and power, plain and reinforced concrete and hydraulics. Prerequisites, 502 and 503. Recitations, five hours per week.

613. Laboratory. Continuation of course 512. One hour credit. One-half day per week. Fee, $3.00.

625. Designing. Design of steam boilers, also study of form, strength and proportions of the frames and moving parts of cranes and other machines, with detail drawings of the same. Reference books, Steam Boilers, Peabody and Miller; Handbook of Information, Cambria Steel Co. Prerequisites, 423, 502 and 512. One hour credit. Three hours per week.

634. Shop Work. Course 533 continued. Two hours' credit. Six hours per week. Fee, $5.00.

642. Descriptive Engineering. Course 541 continued. One hour per week.

686. Analytical Mechanics. Work, Energy and Power and Hydraulics. Prerequisite, course 502. Recitations, four hours per week.

685. Machine Design. Elements of Machine Design. Text book, Machine Design, Smith and Marx. Prerequisites, 502, 503 and 512. Recitations, two hours per week.

704. Heat Engines. Theory and practical application thereof to the steam engine and other heat engines. Text book, Thermodynamics of Heat Engines, Reeve. Prerequisites, course 512, Physics 303, and Mathematics 26. Recitations or lectures, three hours per week.

707. Heating and Ventilation. Study of modern methods for heating and ventilation. Text book, Heating and Ventilating Buildings, by Carpenter. Prerequisite, Physics 303 and simultaneous work in M. E. 726. Recitations or lectures, two hours per week.

708. Railway Mechanical Engineering. Construction and operation of Railway Machinery. Text book, Locomotive Operation, by Henderson. Prerequisites, courses 605, 613 and 625. Recitations or lectures, three hours per week.

714. Laboratory. Efficiency tests of steam, gas, gasoline and hot air engines, boilers, refrigerating machinery and complete plants. Prerequisites, course 613 and simultaneous work in 704. One hour credit. One-half day per week. Fee, $3.00.

726. Designing. Computation and design of heating and ventilating plants, tools and machinery. Prerequisites, courses 605 and 625 and simultaneous work in 707. Two hours' credit. Six hours per week.

735. Shop Work. Advanced machine work, milling, grinding, fitting and assembling. Prerequisite, course 634. Two hours' credit. Six hours per week. Fee, $5.00.

743. Seminar. Written papers and discussions of assigned topics. One meeting per week.

784. Steam Engines and Boilers. Construction, operation and maintenance of standard types of steam engines and boilers. Two lectures or recitations per week.

788. Railway Mechanical Engineering. Construction and operation of railway machinery. Simultaneous work in 784 required. Recitations and lectures, two hours per week.

809. Constructive Engineering. Principles of design and construction of heating, refrigerating, power, lighting and pumping plants in general and detail. Prerequisites, courses 512, 704 and 784. Lectures, three hours per week.

811. Thesis. This course is devoted to special work on an approved topic to be selected before the end of the first semester of the Senior Year. Taken by those students of the Mechanical Engineering Department who have completed the work of the Junior year. Expenses of the thesis are adjusted by special arrangement in each case. Equivalent to four hours per week.

815. Laboratory. Continuation of course 714. One hour credit. One-half day per week. Fee, $3.00.

827. Designing. Design of steam engine, selection of engines, boilers and auxiliaries, arrangement of machinery, and design of piping for steam power plant. Prerequisites, completion of work of Junior year and simultaneous work in 809. Three hours' credit. Nine hours' designing and lecture.

844. Seminar. Written papers and discussions of assigned topics. One meeting per week.

SUBJECT GROUPS IN MECHANICAL ENGINEERING.

The following is a summary of the lines of work given in the Mechanical Engineering Department.

Applied Mechanics and Hydraulics.

401	Analytical Mechanics
502	Analytical Mechanics
503	Materials of Construction
512	Laboratory
605	Machine Design
606	Analytical Mechanics
613	Laboratory
686	Analytical Mechanics

Steam and Power Engineering.

625	Designing
704	Heat Engines
707	Heating and Ventilation
784	Steam Engines and Boilers
788	Railway Mechanical Engineering

708	Railway Mechanical Engineering
714	Laboratory
726	Designing
809	Constructive Engineering
811	Thesis
815	Laboratory
827	Designing

Machine Construction.

117	Technical Lecture
130	Shop Work
218	Technical Lecture
232	Shop Work
331	Shop Work
437	Shop Work
439	Shop Work
533	Shop Work
634	Shop Work
735	Shop Work

Drawing and Design.

121	Mechanical Drawing
181	Mechanical Drawing
322	Mechanical Drawing
423	Mechanical Drawing
483	Mechanical Drawing
524	Valve Gear Design
605	Machine Designing
625	Designing
726	Designing
827	Designing
685	Machine Design

Experimental Engineering.

512	Laboratory
613	Laboratory
714	Laboratory
815	Laboratory

Engineering Literature and Reports.

541	Descriptive Engineering
642	Descriptive Engineering
743	Seminar
811	Thesis
844	Seminar

Department of Civil Engineering

ANSON MARSTON, PROFESSOR.

CHARLES BEECHER STANTON, ASSOCIATE PROFESSOR, RAILWAY ENGINEERING.

JOHN EDWARD KIRKHAM, ASSOCIATE PROFESSOR, STRUCTURAL ENGINEERING.

THOMAS HARRIS MACDONALD, ASSISTANT PROFESSOR, ROAD INVESTIGATIONS.

HOWARD CARLTON FORD, ASSISTANT PROFESSOR, SURVEYING AND IRRIGATION.

*M. I. EVINGER, ASSISTANT PROFESSOR.

ROY WINCHESTER CRUM, ACTING ASSISTANT PROFESSOR.

HARRY WOY GRAY, ASSISTANT PROFESSOR.

VIVIAN DANGERFIELD BEARD, INSTRUCTOR.

CHARLES ALTON BAUGHMAN, INSTRUCTOR.

BRUCE A. COLE, MECHANICIAN.

J. E. O'LEARY, STUDENT ASSISTANT.

The Department of Civil Engineering has its headquarters in Engineering Hall. The offices of the department occupy rooms 311, 315, and 316 in the third story of the building. In addition, the Department has two large class rooms and a large drawing room in the third story, a drawing room 40 feet by 70 feet, and a large class room in the fourth story. The Department also has the use, in common with the other Engineering Departments, of the photographic and blue print rooms in the fourth story, the large Engineering Museum and Library in the third story, and the large Assembly Room in the second story. All of these rooms are finely furnished and equipped throughout.

In connection with the offices provision is made for the systematizing of all the work of the Department, and card indexes for correspondence, equipment, and for general engineering literature are provided.

In addition to the space occupied in Engineering Hall, part of the equipment of the Department is placed in the Engineering Annex. Here are located two large drawing rooms, one recitation room, one instrument room, and two offices, occupied by the departments of surveying and drawing.

In addition, the Department has in Engineering Annex, in conjunction with the Electrical Engineering Department, a repair shop with the services of a mechanician.

The instrumental surveying equipment is kept in a large instrument room on the ground floor of the Engineering Annex where fifty steel lockers have been provided. By means of the lockers, a bulletin board, and a dispensing room, the instruments are let out and returned in a rapid and systematic manner. The system is as nearly automatic as possible and results in a great saving of time to both instructors and students and in an increase in the amount and thoroughness of the work done.

The instrumental equipment includes fifteen engineers' transits, one plain transit, one astronomical transit, one 7-inch altazimuth, one plane table, one surveyor's compass, one railroad compass, one solar compass, six traverse tables, twelve engineers' levels, and numerous chains, tapes, chaining pins, range-poles, level rods, stadia rods, axes, etc. The Department is also well supplied with minor instruments, such as drawing instruments, clinometers, computing machines, planimeter, hand levels, etc. This equipment is being constantly added to from yearly appropriations.

In giving out the instruments for the field work in the Civil Engineering Course the captain of each field party signs a receipt for all apparatus taken out, and upon return of the same these receipts are canceled and kept on file. Students are required to return all apparatus in as good condition as when taken out.

The Structural and Hydraulic Laboratory. Another important part of the equipment of the department is placed in the Structural and Hydraulic Laboratory. On the top floor of this building are located the offices of the Civil Engineering Laboratory work, together with the cement laboratory. The hydraulic laboratory and structural laboratory occupy two large rooms on the first and second floors respectively, which are also used in part by the Mechanical Engineering Department. The hydraulic laboratory is located in the basement and first floor.

The Roads and Paving Laboratory occupies room 106 of the first floor. This room is intended for the testing of materials for roads and pavements. Laboratory tables are provided for the microscopic work and other work in this line. Grinding apparatus is arranged for preparing specimens for crushing and other tests.

This laboratory also contains the abrasion testing machine, the rattler for tests of road materials, the machines for cementation tests of wood materials, a small ball mill, rock crusher and grinder. Apparatus for testing materials of asphalt pavements is also located in this room, inside a glass inclosure. All the apparatus in this laboratory is operated from shafting driven by an electric motor in a separate inclosure. This laboratory is partially equipped by the State Highway Commission and is operated under their direction.

The Cement Laboratory. The cement laboratory is located in the top story of the Structural and Hydraulic Laboratory Building. Stone topped tables are provided on which the mixing and breaking of briquettes and similar work are done. Devices underneath these tables provide for the storing of briquettes. Investigations are constantly under way with cement and similar substances and the cement testing work of the Engineering Experiment Station is carried on in this laboratory. Two cement testing machines are used for breaking the briquettes. There is an ample supply of molds for making the briquettes. Electric ovens and heating appliances are provided for soundness tests of cement, and for absorption tests, etc. The equipment includes two moist closets.

The Hydraulic Laboratory is located in the basement and first story of the Structural and Hydraulic Laboratory. The basement is lined with enameled brick. In the floor above is a large railed opening to the basement occupying about one-third of the floor space. The floors and columns are of reinforced concrete. Water is supplied by about 700 feet of 8 inch and 10 inch cast iron pipe from the college elevated tank of 163,000 gallons' capacity. The available head is about 150 feet.

To supply water at perfectly uniform pressure and at different moderate heads for experimental work, a steel stand pipe is provided, thirty inches in diameter by 40 feet high.

The waste water from all the apparatus discharges into a tank six feet wide by four feet deep by fifty feet long, located in the floor of the basement.

The water is removed from this tank by two sewers, one 6 inches and the other 15 inches in diameter. These are arranged to be used in experiments on the laws of flow in sewer pipes. The laboratory is also provided with wrought iron pipes of different sizes, so arranged that measurements of friction losses in these pipes and in their fittings can be made. Additional apparatus in the nature of weirs, hydraulic motors and pumps of various types is provided.

Structural Laboratory Facilities for other tests of the materials of construction are provided in connection with the Mechanical Engineering Department in the same building. A 100,000 lbs. tension and compression machine, a 100,000 lbs. transverse machine, a 50,000 lbs. tension and compression machine, a torsion testing machine, a 20,000 lbs. wire testing machine, a 10,000 lbs. transverse machine, and other apparatus are provided. Two large laboratory rooms, for computations, instrument rooms, and offices are provided.

Standard Engineering Plans.—The Department has a large collection of blue prints of bridges, roof trusses, buildings and similar structures, which have been kindly donated by the principal corporations engaged in structural engineering throughout the country. In a similar way, the principal railway companies of the country have donated standard plans of railway structures; and many plans and specifications of water works, sewer systems, and other engineering works are also to be found in the Department's collection of standard plans. This collection is constantly being added to. It is arranged systematically in large drawers, in filing cases provided in connection with the office equipment. In the general arrangement, plans relating to the same subject are kept in the same drawer. In addition, a card index is provided whereby any drawing in the collection can readily be found.

Water Works and Sewage Disposal Plant.—The Civil Engineering Department designed and supervised the construction of the college water works. The College water tower is the largest in the State. It was designed with special reference to its architectural appearance and cuts of it have been published in four of the books treating of the design of such structures. The pumping machinery is so arranged that college students can readily make tests of the efficiency of the apparatus as part of the class work.

The Civil Engineering Department has also designed and supervised the construction of the College sewage disposal system. This is the first purification plant installed in the State and has been very successful.

The water works system and sewage disposal plant are utilized, so far as possible, to furnish practical object lessons to the students in Hydraulic and Sanitary Engineering.

The Alumni of the Department.—The Civil Engineering Department of the Iowa State College is proud of the record made by its

Alumni, in all branches of Civil Engineering, as shown by their eminence as engineers. They are to be found located in responsible positions throughout the country and abroad. The Department maintains an Alumni Directory and endeavors to keep in touch, so far as possible, with its graduates. It is often the case that the Department is able to be helpful to the Alumni by recommending them for positions. The Department receives more and more calls for men to fill good positions. Many of these calls come from the older Alumni themselves.

The nature of the positions open to new graduates may be seen from those occupied by one class one year after graduation. Of this class eleven were engaged in railway engineering in the states of Iowa, Illinois, Nebraska, South Dakota, Idaho, New Mexico, Arizona and Washington; two were engaged in reinforced concrete work in Iowa and New York respectively; four were in Panama on the Panama canal work; one was employed on the Government Civil Engineering work in the Philippine Islands; two were employed with consulting engineers in general engineering practice in Texas and New York respectively; four were employed in irrigation engineering work in Wyoming. Montant, and California; four were employed in structural engineering work in St. Louis, Chicago, and Ambridge, Penn.; one was engaged in water works construction in Iowa, and one was an instructor at the Iowa State College. The salaries of these men ranged up to $125 per month.

During the year we usually have calls considerably exceeding the total number of the graduating class to fill good positions.

Civil Engineering Course of Study.—This course includes a very careful study of English, Modern Language, either French, German or Spanish, History, Civics, and Economic Science, pure and applied Mathematics, Physics, Geology and Chemistry, together with the professional studies in Civil Engineering.

For detailed information as to the nature of the professional work given in the course of Civil Engineering, the reader is referred to the statements regarding each specific subject under the head of "Courses" below. Mechanical Drawing, Lettering, the use of Water Colors and Pen Topography are studied in the Sophomore Year. In the course of instruction in Drawing it is attempted to give the student such facility in drawing that he can do creditable work in an engineering drafting office. Especial attention is paid to Lettering in the finishing up of all other drawings made in connection with his other professional work. The student is required to letter them plainly and neatly and to make finished plates. Throughout the Sophomore, Junior and Senior years the student has practice in the preparation of maps and of drawings and plans of various engineering structures.

The work in Field Surveying practice begins in the Freshman year and continues for three years, six hours per week, with the exception of the second term of the Freshman year, when only three hours are devoted to Field Practice. The student becomes familiar with the various instruments and methods by actually using them. Starting with the simplest problems—pacing, ranging, chaining, and compass work, he gradually works up to the use of the transit, level, and other instruments of greater accuracy and delicacy. He becomes familiar with land surveying, leveling, topographical surveying and railroad surveying by actual work in the field. It is the aim of the course to give the student the facility in the handling of instruments and in the carrying out of operations in field surveying which can only be acquired by considerable practice. It is also attempted to give him as much experience as possible in the handling of small parties of men. Besides the above work students actually camp in the field for two weeks in each of three summer vacations, and so become familiar with topographical work on a more extended scale. In lieu of this summer surveying many students obtain remunerative work with engineers throughout the summer vacation. Such work, when properly certified to by the engineer under whom it is taken, is accepted in lieu of the summer camp surveying. Students are encouraged and urged to secure positions of this kind, as it not only assists them financially, but also is of great benefit to them in connection with their professional training.

A course of instruction in Land, Topographical, City and Mining Surveying, and Drainage Engineering, runs throughout the Sophomore year and one in Railway Engineering runs throughout the Junior year.

Electric Railways and Power Transmission are also studied in the Junior year.

Instruction in Roads and Pavements is given in the first semester of the Senior year. Sanitary Engineering, Water Works Engineering, Bridge Engineering, and Masonry Structures and Foundations are taught in the Senior year. For the details of each of these courses reference should be made to the information given below under the specific course named. The designing of engineering structures by the student begins in the second semester of the Junior year and continues throughout the Senior year. In this work the student actually designs roof trusses and stone and steel truss bridges, preparing the working drawings. A course of actual practice in testing the various materials of construction in the Engineering Laboratory is given in the Junior and Senior years, and is of great value in familiarizing the student with methods of testing and with the properties of the materials of construction.

General instruction in engineering practice and in the spirit of the profession is given by courses of technical lectures in the Freshman and Sophomore years, and by Seminar work of the Junior and Senior years.

Besides the work as given in the outlined course of study, the student in Civil Engineering gains a large part of his experience and training by inspection of engineering work on the inspection tours arranged for the upper classmen. It is planned at least once a year to have the Senior students go on an inspection trip to some point where various engineering works can be inspected and their instructive features noted. Trips are made to Chicago, St. Paul, St. Louis, and other places.

Valuable instruction is also obtained by listening to lectures given by non-resident lecturers. Practicing engineers are invited to the College to give lectures to the engineering students upon the subjects in which they are experts.

The work of the course finally culminates in the thesis, an original investigation carried on by the student to demonstrate his ability to do such work before he graduates. In the past large amounts of time have been devoted by students as a rule to this work, and it has often been the case that the results have been found worthy of publication. Each student should attempt to make his thesis one of the things of which he can justly be proud throughout the remainder of his professional career.

Civil Engineering Society. A Civil Engineering club composed of Senior and Junior Civil Engineering students has recently been organized with a membership of more than 100. This club holds regular meetings every two weeks at which addresses are given by representative engineers secured from outside places, or, in some cases, programs are given prepared by the members of the society. So far, the society has been very successful, and it is believed that it will become a very important factor in the training of civil engineers in this college.

COURSES IN CIVIL ENGINEERING.

FOUR-YEAR COURSE IN CIVIL ENGINEERING.

The four-year Civil Engineering Course, as given below, leads to the degree of Bachelor of Science in Civil Engineering. Graduates of this four-year course can secure the advanced degree of Civil Engineer on the completion of five years of successful professional work and the presentation of a satisfactory thesis, or by taking one year of post-graduate work at the College, completing one year of satisfactory professional work and presenting a satisfactory thesis.

N. B. Engineering Course Numbers.—The number in hundreds place indicates the semester in which the subject is taught. If the subject is also taught in a previous semester, the true course number is followed by the descriptive course number in parenthesis.

*Freshman Year.

FIRST SEMESTER.

		Required Semester Hours.
Mathematics 20	Algebra	4
Mathematics 21	Plane Trigonometry	1
Modern Languages		

The Language selected must be carried through the entire year.

Choice	Language 18 or 57	French	3	3
	Language 20 or 5a	German	3	
	Language 36 or 33	Spanish	3	
	Literature 15	English	3	

Students will be assigned to Modern Language courses under the following rules:

I. Students with four credits in a modern language;

1. Should continue the same language by taking Course 18, 36 or 20.

2. May take French 57 or Spanish 33, provided that satisfactory reasons for the change are presented to the Dean of the Junior College and the head of the Modern Language Department.

II. Students entering with two credits in German and two in Latin, will take German 5a.

III. Students entering with four credits in Latin may take Literature 15, French 57 or Spanish 33.

English 10	Narration and Description	3
Chemistry 41	General Chemistry	3
Civil Engineering 102	Field Work	2
Civil Engineering 101	Civil Engineering Drawing	1
Mechanical Engineering 181	Mechanical Drawing	1
Civil Engineering 141	Technical Lecture	
Military 1	Military Drill	
	Total semester hours	18

SECOND SEMESTER.

		Required Semester Hours.
Mathematics 22	Trigonometry	2
Mathematics 23	Analytical Geometry	3
Modern Languages		

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*Freshmen who show deficient preparation in English or Mathematics may be assigned by the Dean of the Junior College and the Dean of Engineering, to special classes, with one hour more work than indicated above, and in case of clear indication of failure in either of these subjects, even with this arrangement, they will be dropped from the Freshman work in this line until they have given proof of sufficient preparation to enable them to carry the work successfully.

The Language selected must be a continuation of the one chosen in the first semester.

Choice	Language 19 or 58	French 3	3
	Language 21 or 6a	German 3	
	Language 37 or 34	Spanish 3	
	Literature 16	English 3	
	English 11	Exposition	3
	Chemistry 49	General Chemistry	4
	Civil Engineering 204	Descriptive Geometry	2
	Civil Engineering 203	Field Work	1
	Civil Engineering 242	Technical Lecture	
	Military 2	Military Drill	
	Civil Engineering 231	Summer Surveying	

All students in Civil Engineering go into camp fifteen days each summer vacation for surveying practice.

Total semester hours 18

Sophomore Year.

THIRD SEMESTER.

		Required Semester Hours.
Mathematics 24	Analytical Geometry	2
Mathematics 25	Calculus	3
English 12	Argumentation	2
Physics 303	Mechanics and Heat	5
Civil Engineering 308	Surveying	4
Civil Engineering 349	Advanced Descriptive Geometry	1
Civil Engineering 305	Drawing	1
Civil Engineering 343	Technical Lecture	
Military 3, or Athletics		
	Total semester hours	18
**History 17,	The American People	1

To be taken in Sophomore or Junior year.

FOURTH SEMESTER.

		Required Semester Hours.
Mathematics 26	Differential and Integral Calculus	4
Physics 404	Electricity and Magnetism and Light and Sound	5
Mechanical Engineering 401	Analytical Mechanics	3
Civil Engineering 409	Surveying	4
Civil Engineering 450	Advanced Descriptive Geometry	1
Civil Engineering 407	Drawing	1

**Members of intercollegiate debating teams will be given two hours, credit therefor, elective with History 17 and 18.

Civil Engineering 444	Technical Lecture	
Military 4, or Athletics		
Civil Engineering 432	Summer Surveying	

All students in Civil Engineering go into camp fifteen days each summer vacation for surveying practice. —

	Total semester hours	18
History 18	American Statesmen	1

To be taken in Sophomore or Junior year.

Junior Year.

FIFTH SEMESTER.

		Required Semester Hours.
Mechanical Engineering 502	Analytical Mechanics	5
Civil Engineering 510	Railway Engineering	5
Electrical Engineering 503	Electric Railways and Power Transmission	2
Physics 523	Physical Laboratory	1
Mathematics 27	Spherical Trigonometry	1½
Civil Engineering 524	Practical Astronomy and Geodesy	2½
Civil Engineering 514	Civil Engineering Laboratory	1
Civil Engineering 527	Civil Engineering Seminar	
		—
	Total semester hours	18

SIXTH SEMESTER.

		Required Semester Hours.
Mechanical Engineering 686	Analytical Mechanics	4
Civil Engineering 611	Railway Engineering	4
Engineering 603	Conservation of Natural Resources	1
Civil Engineering 617	Structural Engineering	4
Civil Engineering 653	Materials of Construction	2
Economic Science 14	Outlines of Economics	2
Civil Engineering 615	Civil Engineering Laboratory	1
Civil Engineering 628	Civil Engineering Seminar	
Civil Engineering 633	Summer Surveying	
		—
	Total semester hours	18

All students in Civil Engineering go into camp fifteen days each summer vacation and conduct an organized topographical survey. In place of the two weeks' summer surveying for any year there may be substituted not less than four weeks' actual engineering work done for some competent engineer, a reputable firm, or department engaged in engineering work, if certified by engineer under whom taken, on regular blank furnished by Department of Civil Engineering.

Senior Year.

SEVENTH SEMESTER.

		Required Semester Hours.
Civil Engineering 718	Structural Engineering	2
Civil Engineering 720	Arches and Reinforced Concrete	2
Civil Engineering 712	Roads and Pavements	2
Civil Engineering 723	Masonry and Foundations	2
Civil Engineering 721	Sanitary Engineering	3
Mechanical Engineering 784	Steam Engines and Boilers	2
Civil Engineering 716	Civil Engineering Laboratory	1
Civil Engineering 725	Thesis begun	
Civil Engineering 729	Seminar	
Engineering 702	Specifications and Contracts	1

Special Line of Work.

Each Senior Civil Engineer must elect one of the following special lines at the beginning of his Senior year and this election will govern throughout both Senior semesters.

Choice	Civil Engineering 738	Structural Engineering 3	3
	Mechanical Engineering 788, and Civil Engineering 754	Railway Mechanical Engineering 2 Signal Engineering 1	
	Civil Engineering 735	Irrigation Engineering 3	
		Total semester hours	18

EIGHTH SEMESTER.

		Required Semester hours
Civil Engineering 819	Structural Engineering	5
Civil Engineering 822	Water Supply Engineering	3
Choice Geology 803 Physics 801	Engineering Geology Illumination Engineering	3
Civil Engineering 826	Thesis	3
Civil Engineering 830	Seminar	
Engineering 801	History of Engineering	1

Special Line of Work.

The special line of work selected at the beginning of the Senior year must be continued through the semester.

Choice	Civil Engineering 839	Structural Engineering 3	3
	Civil Engineering 834	Railway Economics 3	
	Civil Engineering 836	Hydraulic Engineering 3	
		Total semester hours	18

Optional:

Students obtaining the approval of the head of the department may classify, during any semester of the Junior or Senior years, in two hours of optional technical or culture work. The following list is suggested: Bacteriology 4, Economic Science 12, English 8, History 7, 9, Horticulture 17, Languages 15, 16, 19, 20, Literature 13, 14, Public Speaking 17, and the courses in Industrial Chemistry.

FIVE-YEAR COURSE IN CIVIL ENGINEERING.

The Five-Year Course in Civil Engineering includes all of the work of the four-year course plus much general culture and elective culture and science work and some elective advance engineering work. All such engineers as can do so are urged to take this five-year course instead of the four-year course. It leads to the degree of Bachelor of Science in Civil Engineering as in the case of the four-year course, but graduates of the five-year course can secure the advance Civil Engineering degree on the completion of only one year of successful professional work and the presentation of a satisfactory thesis.

N. B. Engineering Course Numbers.—The number in hundreds place indicates the semester in which the subject is taught. If the subject is also taught in a previous semester, the true course number is followed by the descriptive course number in parenthesis.

Freshman Year.

FIRST SEMESTER.

		Required Semester hours
Mathematics 20	Algebra	4
Mathematics 21	Plane Trigonometry	1
Modern Language		

The Language selected must be carried through the entire year.

Choice	Language 18 or 57	French	3	3
	Language 20 or 5a	German	3	
	Language 36 or 33	Spanish	3	
	Literature 15	English	3	

Students will be assigned to Modern Language courses under the following rules:

I. Students with four credits in a Modern Language:

1. Should continue the same language by taking Courses 18, 36 or 20.
2. May take French 57 or Spanish 33, provided that satisfactory reasons for the change are presented to the Dean of the Junior College and the head of the Modern Language Department.

II. Students entering with two credits in German and two in Latin, will take German 5a.

III. Students entering with four credits in Latin may take Literature 15, French 57 or Spanish 33.

English 10	Narration and Description	3
History 6	French Revolution and XIX Century	3
Civil Engineering 101	C. E. Drawing	1
Mechanical Engineering 181	M. E. Drawing	1
Civil Engineering 102	Field Work	2
Civil Engineering 141	Technical Lecture	
Military 1	Drill	
	Total semester hours	18

SECOND SEMESTER.

		Required Semester hours
Mathematics 22	Trigonometry	2
Mathematics 23	Analytical Geometry	3
Modern Language		

The Language selected must be a continuation of the one chosen in the first semester.

Choice	Language 19 or 58	French 3	3
	Language 21 or 6a	German 3	
	Language 37 or 34	Spanish 3	
	Literature 16	English 3	

English 11	Exposition	3
History 4	Divison and Reunion	3
Civil Engineering 204	Descriptive Geometry	2
Civil Engineering 203	Field Work	1
Civil Engineering 206	C. E. Drawing	1
Civil Engineering 242	Technical Lecture	
Military 2	Drill	
Civil Engineering 231	Summer Surveying	

All students in Civil Engineering go into camp fifteen days each summer vacation for surveying practice.

	Total semester hours	18

Sophomore Year.

THIRD SEMESTER.

		Required Semester hours
Mathematics 24	Analytical Geometry	2
Mathematics 25	Calculus	3
English 12	Argumentation	2

Chemistry 2	General Chemistry	5
Civil Engineering 308	Surveying	4
Civil Engineering 343	Technical Lecture	
Elective	Non-technical Work	2
Military 3, or Athletics		
	Total semester hours	18

FOURTH SEMESTER.

		Required Semester hours
Mathematics 26	Differential and Integral Calculus	4
English 13	Advanced Composition	2
Chemistry 5	Qualitative Analysis	5
Civil Engineering 409	Surveying	4
Civil Engineering 444	Technical Lecture	
Elective	Non-technical Work	3
Military 4, or Athletics		
Civil Engineering 432	Summer Surveying	

All students in Civil Engineering go into camp fifteen days each summer vacation for surveying practice.

Total semester hours 18

Junior Year.

FIFTH SEMESTER.

		Required Semester hours
Physics 503 (303)	Mechanics and Heat	5
Economic Science 9	Outlines of Economics	3
Mathematics 27	Spherical Trigonometry	1½
Civil Engineering 524	Practical Astronomy and Geodesy	2½
Civil Engineering 505 (305)	C. E. Drawing	1
Civil Engineering 549 (349)	Advanced Descriptive Geometry	1
Elective:	Non-technical Work	4
	Total semester hours	18

SIXTH SEMESTER.

		Required Semester hours
Physics 604 (404)	Electricity and Magnetism and Light and Sound	5
Economic Science 15	Engineering Economics	3
Mechanical Engineering 601 (401)	Analytical Mechanics	3
Civil Engineering 650 (450)	Advanced Descriptive Geometry	1

Civil Engineering 607 (407)	C. E. Drawing	1
Elective:	Non-technical Work	5
Civil Engineering 633	Summer Camp	

All students in Civil Engineering go into camp fifteen days each summer vacation for surveying practice. —

Total semester hours 18

Senior Year.

SEVENTH SEMESTER.

		Required Semester Hours.
Mechanical Engineering 702 (502)	Analytical Mechanics	5
Civil Engineering 710 (510)	Railway Engineering	5
Electrical Engineering 703 (503)	Electric Railways and Power Transmission	2
Physics 723 (523)	Physical Laboratory	1
Civil Engineering 714 (514)	C. E. Laboratory	1
Elective:		4
	Total semester hours	18

EIGHTH SEMESTER.

		Required Semester Hours.
Mechanical Engineering 886 (686)	Analytical Mechanics	4
Civil Engineering 811 (611)	Railway Engineering	4
Civil Engineering 817 (617)	Structural Engineering	4
Civil Engineering 853 (653)	Materials of Construction	2
Civil Engineering 815 (615)	C. E. Laboratory	1
Engineering 803 (603)	Conservation of Natural Resources	1
Elective:		2
	Total semester hours	18

Post Senior Year.

NINTH SEMESTER.

		Required Semester Hours.
Civil Engineering 918 (718)	Structural Engineering	2
Civil Engineering 920 (720)	Arches and Reinforced Concrete	2
Civil Engineering 912 (712)	Roads and Pavements	2
Civil Engineering 923 (723)	Masonry and Foundations	2

Civil Engineering 921 (721)	Sanitary Engineering	3
Mechanical Engineering 984 (784)	Steam Engines and Boilers	2
Civil Engineering 916 (716)	C. E. Laboratory	1
Civil Engineering 925 (725)	Thesis begun	
Engineering 902 (702)	Specifications and Contracts	1
Elective:	Civil Engineering Work	3
	Total semester hours	18

TENTH SEMESTER.

		Required Semester Hours.
Engineering 1001 (801)	History of Engineering	1
Civil Engineering 1019 (819)	Structural Engineering	5
Civil Engineering 1022 (822)	Water Supply Engineering	3
Geology 1003 (803)	Engineering Geology	3
Civil Engineering 1026 (826)	Thesis	3
Elective:	Civil Engineering Work	3
	Total semester hours	18

101. Free Hand Lettering. Practice work on plain alphabets, both free hand and mechanical, with special attention to the simple free hand lettering. Preparation of plates illustrating the various types of letters and their uses in working drawings, maps, titles, etc. Text book, Reinhart's Lettering. One hour credit. Three hours' drawing per week.

102. Field Work. Two hours' credit. Six hours' field work per week. Fee, $3.00.

Courses 102 and 203 are intended to train the student in the solution of the simple surveying problems and in the use of the simple surveying instruments; to give him a thorough preparation for the surveying work of the Sophomore year; and to give him sufficient experience to enable him to obtain a position as chainman or rodman during the summer vacation.

The class is divided into squads of three men each, the idea being to keep the number of men in a squad as low as is consistent with performing the work in order that each man may become familiar with all parts of the work. Pence & Ketchum's "Surveying Manual" is used as a text book and the men are required to perform the problems in strict accordance with the instructions in the "Manual," to check their work within practical limits, and to keep, in a standard field book, complete notes of all problems. Office problems are given from time to time, and as the field work requires it, recitations and lectures are given.

Note—The work in courses 102 and 203 is preparatory to the Field Work of the Sophomore and Junior year, which takes the same number of hours per week each year. Thus the student has the training to be obtained by three years' actual experience in the field.

141. Technical Lectures. Lectures on the Civil Engineering profession, including definitions and general discussion of engineering, the different branches of Civil Engineering and general discussion of each, the ideals of the profession, the reading of current literature and other general Civil Engineering topics of interest to young men entering the profession. One lecture per week.

203. Field Work. Prerequisite, C. E. 102. Credit, one hour. Three hours' field work per week. Fee, $2.00. For general explanation of the work covered by this course of study, see Course C. E. 102, of which this course is a continuation.

204. Descriptive Geometry. Descriptive Geometry is the connecting link between pure mathematics and technical drawing, and is taught partly as a theoretical and partly as an applied subject. It is the basis of all technical drafting. Many of the problems solved in the drawing room have direct application to engineering work. Prerequisites, Mechanical Drawing 181, Mathematics 3 and 5. Two hours' credit. Four hours' drawing and two hours' lecture, per week.

206. Free Hand Drawing. Exercises in the rendering of free hand sketches. One hour credit. Three hours' drawing per week.

231. Summer Surveying. Fifteen days' work in the field. See Course 633.

242. Technical Lecture. Lectures on the work of the axemen, chainmen, and rodmen in general surveying and railway surveying and on camp equipment and management. One lecture per week. Three lectures of this course are given by College Librarians in explanation of catalogues and use of reference books.

305. Topographical Drawing. Course 101 continued. Practice with water colors, as used in tinting and in shading, the formation and use of topographical and structural symbols, contours and hatchings, and the preparation of topographical maps. One hour credit. Three hours per week.

308. Surveying. Prerequisites, Mathematics 23 and C. E. 203. Four hours' credit. Recitations, two hours, and field work, six hours, per week. Fee, $3.00.

Courses 308 and 409 are continuations of Courses 102 and 203. The same method of organizing squads is followed. The work takes up the care and adjustments of surveying instruments, various problems in surveying illustrating the measurement of angles, running traverses by several methods, differential and profile leveling, uses of the plane table, determination of the true meridian by both Polaris and Solar observations, taking topography by various methods and land surveying, with special reference to United States system of land subdivision and to the retracing of lines and location of lost corners. Office work in connection with the field work requires the plotting of maps and profiles, the calculation of areas and balancing of surveys. Calculation of quantities and estimates of cost are made in connection with paving and drain surveys. Pence & Ketchum's "Surveying Manual" is used as a field manual.

The recitations cover Breed & Hosmer's "Principles and Practice of Surveying, Vol. I."

The study of Drainage Engineering demands special attention in this State and the course is adapted to such needs. The principles of the subject receive careful attention in the class room and are put into immediate practice in the investigation of various tracts of land in the vicinity of the College where development by drainage is advisable. The thorough drainage of individual farms is considered, and also the engineering and legal methods employed on large districts under county control. The usual reports of the engineer are required from each student, including complete maps and profiles, estimates of cost, and the report of the Commission on the assessment of the various properties. During the past few years it has frequently been found practicable for students to find remunerative work at drainage engineering at various places in the state in addition to their regular class work. Elliott's "Engineering for Land Drainage" is used as a text book for this portion of the work.

343. **Technical Lecture.** Lectures covering the entire status of engineering in a general way. One lecture per week.

345. **Surveying.** Prerequisite, Mathematics 23. Two hours' credit. One recitation and three hours' field work per week. Fee, $2.00. See course 446.

349. **Advanced Descriptive Geometry.** Consists in the solution of problems relating to warped surfaces and the preparation of isometrical projections of standard structures from working drawings. Text book, MacCord's Descriptive Geometry. Prerequisite, C. E. 204. One hour credit. Three hours' drawing and lecture required.

407. **Drawing. Plans of Structures.** Course 305 continued. Preparation of working drawings of standard structures, especially railway structures. Prerequisite, course 305. One hour credit. Three hours per week.

409. **Surveying.** Prerequisite, C. E. 308. For general explanation of the work covered by this course of study, see course number 308. Credit, four hours. Recitations, two hours, and field work, six hours, per week. Fee, $3.00.

432. **Summer Surveying.** Fifteen days' work in field. See course 633.

444. **Technical Lecture.** Lectures on drainage and topographical surveying, and on work of inspectors. One lecture per week.

Courses 141, 242, 343 and 444, inclusive, are required of all Civil Engineers, and are designed to help inculcate the spirit of the engineering profession, and to permit the presentation of many things essential to the Civil Engineer which cannot readily be given in connected form in connection with the individual subjects of the course.

446. Surveying. Prerequisites, Mathematics 23 and C. E. 245. Two hours' credit. One recitation and three hours' field work per week. Fee, $2.00.

Courses 345 and 446 are an abridgement of courses 308 and 409 and aim to cover only the most important uses of the tape, level and transit. Text book, Pence and Ketchum's "Surveying Manual."

450. Advanced Descriptive Geometry. The drawing is based on the principles of Descriptive Geometry and includes the solution of a number of problems in Shades, Shadows and Perspective. The work in Perspective Drawing includes the preparation and architectural rendering of a perspective drawing of a building or engineering structure, from the detailed plans. Prerequisite, course 204. One hour credit. Three hours per week.

508. Surveying. For description of this course, see C. E. 308. Prerequisites, Mathematics 17 and Agricultural Engineering 4. Four hours' credit. Recitation, two hours, and field work, six hours, per week. Fee, $3.00.

510. Railway Engineering. Study of the methods of railway location, preliminary surveys made by both the cross section and the stadia methods; methods of the solution of the simple, compound, and vertical curves; the transition spiral, crossovers, turnouts, and wye tracks; the computation of earthwork and the determination of haul by the mass diagram. During this semester a preliminary survey is made of a short line from which is prepared a contour map on which a paper location is made and the field notes calculated. This line is then located in the field and cross-sectioned. The grading is calculated, bills of material made up, bridges staked out, and cost of line is estimated. Text book, Allen's "Curves and Earthwork," Talbott's "Transition Spiral." Prerequisites, Civil Engineering, 102, 203, 308, and 409. Five hours' credit. Recitations, three hours, and field work, seven hours, per week. For one of the recitations, three hours of office work is substituted during part of the semester. Fee, $3.00.

514. Engineering Laboratory. Work in making various standard tests of cement, sandstone, concrete building stone, building and paving brick, etc. Prerequisite, M. E. 401. Must be accompanied by M. E. 502. One hour credit per semester. Fee, $3.00.

524. Practical Astronomy and Geodesy. A brief course in Astronomy and Geodetic Surveying and a study of ordinary methods of determining latitude, longitude, azimuth, and time with their application to Geodetic Surveying. Prerequisites, C. E. 102, 203, 308, 409. Two and one-half hours' credit. Recitation, four hours, and laboratory, three hours, per week, during last ten weeks of the semester.

527. **Engineering Seminar.** See course 830.

611. **Railway Engineering.** Study of the methods of railway construction, and maintenance, standard structures, track accessories, yards and terminals, etc., and the details of the economics of railroad location are dealt with at some length. The field work of this semester consists in the making of station surveys of existing towns, and the mapping of the same. The measuring and detailing of trestles, slip switches, turnouts, etc. Texts, Raymond's "Railroad Engineering;" Tratman's "Railway Track and Track Work." Prerequisite, Civil Engineering 510. Four hours' credit. Recitations, two hours a week, and field work or drafting, seven hours a week. Fee, $3.00.

615. **Structural Laboratory.** Experiments and investigations to verify the experimental laws; tests for strength and elasticity of wood, iron and steel in tension, compression, torsion and flexure. Prerequisites, C. E. 514 and M. E. 502, and must be accompanied by C. E. 653. One hour credit. Fee, $3.00.

617. **Structural Engineering.** The recitation periods for the first few weeks are devoted to practical lectures upon the manufacturing of the standard steel shapes (from ore to finished product) and upon the fabricating of steel structures in the structural shops, from these shapes, and upon the general construction of steel structures, pointing out the names and the construction of the various types of structures; also the names and style of details of their parts so as to give the student a general knowledge of the details of metal structures before considering the theory involved in their design. At the same time, in the drawing room, the student is trained in making detail drawings of typical parts of structures, such as I beams with standard connections, posts, stringers, floor-beams, etc. This is intended to train the student in structural drafting and at the same time in the use of manufacturers' Hand Books. After this lecture course and throughout the remainder of the semester, the recitations are devoted to the theory of stresses in ordinary metal structures while the work in the drawing room consists of actual determining of stresses in the above structures by the analytical and graphical methods, and also by the method of influence lines, using both uniform and concentrated loads, and of the designing and detailing of some of the above structures. Credit, four hours.

628. **Engineering Seminar.** See Course 830.

633. **Summer Surveying.** Fifteen days' work in field.

In the work of Courses 231, 432, and 633, several of the professors of Civil Engineering and the students in Civil Engineering go into camp for fifteen days each summer vacation beginning the Saturday before Commencement, and conduct an organized topographical survey of some region in the state. Each year's work continues that of the preceding year, until a large area is mapped. At present Lake Okoboji and surrounding territory are being mapped. Lower classmen will serve in subordinate positions. Upper classmen will take responsible charge of parties, and will do the triangulating and final mapping. Students must pay their own traveling and living expenses. A corps of student officers has direct charge of the work, part of these officers being elected by the students and part appointed by the Department. It is one of the greatest honors in the course of Civil Engineering to be chosen on this corps of officers. The list of student officers for the summer camp of 1909 was as follows:

Chief Engineer—F. M. Schader.
Assistant Chief Engineer—W. G. Stoulil.
Computer—E. W. Blumenshein.
Chief Draughtsman—C. Mosher.
Junior Commissary—C. F. Merten.
Sophomore Commissary—P. M. Simmons.
Freshman Commissary—W. P. Nemmers.

653. Materials of Construction. A study of the properties and requirements for the more important materials used in engineering construction. Methods of testing and inspection of materials. Prerequisite, M. E. 502. Johnson's "Materials of Construction," and Taylor and Thompson's "Concrete, Plain and Reinforced." (Revised Edition.) Two hours' credit.

656. Structural Engineering. The recitation periods for the first few weeks are devoted to practical lectures upon the manufacturing of the standard steel shapes (from ore to finished product) and upon the fabricating of steel structures in the structural shops, from these shapes, and upon the general construction of steel structures, pointing out the names and the construction of the various types of structures; also the names and styles of details of their parts so as to give the student a general knowledge of the details of metal structures before considering the theory involved in their design. At the same time, in the drawing room, the student is trained in making detailed drawings of typical parts of structures, such as I beams with standard connections, posts, stringers, floor-beams, etc. This is intended to train the student in structural drafting and at the same time in the use of manufacturers' Hand Books. After this lecture course, and throughout the remainder of the semester, the recitations are devoted to the theory of stresses in ordinary metal structures while the work in the Drawing Room consists of actual determining of stresses in the above structures by the analytical graphical methods, and also by the method of influence lines, using both uniform and concentrated loads, and of the designing and detailing of some of the above structures. Three hours' credit.

712. Roads and Pavements. Study of good roads problem, traffic over country roads, tractive resistance, the best methods of constructing and maintaining earth, gravel, and broken stone roads, and the cost of various kinds of roads. In the study of country roads, especially as relating to Iowa conditions, great assistance is given by the fact that the College is by law the State Highway Commission of Iowa. All its data, plans, maps and publications are available and are largely made use of. In connection with pavements among the topics studied are city streets and grades, classes and methods of construction of pavements, and the cost of various kinds of paving. Text book. Baker's "Roads and Pavements." Recitations, two hours per week.

713. Roads and Pavements. Work similar to Course 712. Text book, Baker's "Roads and Pavements." Recitations, two hours per week.

716. Hydraulic Engineering. Experimental work in the observation and measurement of pressure, velocity, and flow; in power and efficiency; and in the determination of experimental coefficients. Prerequisite, M. E. 686. Fee, $3.00.

718. Structural Engineering. After a short review of the structural work taken in the Junior year, the remainder of the semester is devoted to the theory of stresses in what is known as "higher structures," that is, cantilever and suspension bridges, steel arches, lift bridges, draw bridges, etc., and to the designing of same. Credit, two hours.

720. Arches and Reinforced Concrete. The recitations are devoted to the mechanics of reinforced concrete construction and masonry, analyzing the stresses in reinforced concrete slabs, beams, floors, roofs, retaining walls, and also masonry and reinforced concrete arches. The work in the drawing room consists of: Designing a reinforced concrete beam highway bridge; beams, columns, and floor for an office building; designing of a masonry and a reinforced concrete arch, and also a retaining wall, making complete tracings of most of the designs. Text book, "Principles of Reinforced Concrete Construction," by Turneaure and Maurer, supplemented by Instructor's Notes. Two hours' credit.

721. Sanitary Engineering. Study of principles and methods involved in the design, construction and maintenance of sewerage systems, house plumbing and sewage disposal. Prerequisite, M. E. 686. Text book, Folwell's "Sewerage," and Professor Marston's Notes. Two recitations and one afternoon of designing per week. Three hours' credit.

723. Masonry Structures and Foundations. A study of the principles involved in the design, construction and maintenance of all classes of masonry structures, and in the design and construction of foundations. Prerequisite, C. E. 653. Baker's "Treatise on Masonry Construction," (Revised Edition), and Taylor and Thompson's "Concrete, Plain and Reinforced." (Revised Edition). Two hours' credit.

725. Thesis. Work begun.

729. Engineering Seminar. See Course 830.

735. Irrigation Engineering. For those students who elect special work in Hydraulic Engineering. Irrigation history and laws, the use and duty of water, a study of stream flow and storage problems, irrigation surveys and designs, the design and construction of ditches, flumes, dams, and reservoirs. Special attention is given to the work of the United States Reclamation Service. Considerable time is devoted to reference work, consisting in studying and preparing reports upon various irrigation systems and structures and other topics of interest. In this work the current technical literature is used to a large extent. Three hours per week are devoted to designing of irrigation structures, dams, headworks, regulators, canals, drops, siphons, etc. Estimates of cost of structures designed are made. The text book is Wilson's "Irrigation Engineering." Prerequisite, M. E. 686. Three hours' credit. Recitations, two hours, and designing, three hours, per week.

738. Structural Engineering. For students who elect special work in Structural Engineering. This course is taught in conjunction with Civil Engineering 718 in a special class to students taking structural engineering, making a total of seven credit hours. The work in "higher structures" is very much more thorough and complete than in 718 alone. Three hours' credit.

751. Surveying. Course 751 is designed to give to students in Electrical Engineering a good working knowledge of the engineer's transit and level and their common uses, sufficient to enable them to perform such elementary surveying problems as they are likely to meet in connection with their electrical work. Text book, Pence & Ketchum's Surveying Manual. Prerequisite, Mathematics 23. Credit, three hours. Recitation, one hour, and field work, six hours, per week. Fee, $3.00.

754. Signal Engineering. For those who elect special work for Senior year in Railway Engineering. A study of the methods of signalling by the various railroads, their relative effectiveness and the rules governing the use of the same ,train orders, interlocking, etc. Prerequisites, Civil Engineering 510 and 611. One hour credit.

819. Structural Engineering. This work during the first part of the semester is really a continuation of the structural work taken by same students in the first semester, after which the time will be devoted to a general review of Structural Engineering, in order that the student may have a working knowledge of the subject. Five hours' credit.

822. Water Supply Engineering The principles and methods involved in the design, construction and maintenance of waterworks systems. Prerequisite, M. E. 686. Text book, Turneaure and Russel's

"Water Supply Engineering." Three recitations and one afternoon of designing per week. Three hours' credit.

826. Thesis. Original research on some chosen subject, as the study and design of some engineering project (including the surveys), the investigation of some engineering question, or an experimental investigation. Three hours' credit. Nine hours per week. Students are required to put in as much additional time as may be necessary to thoroughly work up the subject chosen, and to prepare a well-digested and complete write-up of the results.

830. Civil Engineering Seminar. The Civil Engineering Seminar, Courses 527, 628, 729 and 830, meets once each week, while College is in session, and has for its members the professors and the instructors in Civil Engineering, and all students in the Junior and Senior classes in the course in Civil Engineering. Seminar programs consist of papers prepared by engineering students under the direction of the professor in charge.

834. Railway Economics. For those students who elect special work for Senior year in Railway Engineering. Study of the organization, operation, construction, extension, improvement, existing conditions, operation and regulation of railways with reference to their great duty as public servants as well as their obligations to the holder of their securities.

First—A study of the principles of incorporation, keeping in mind the weighty obligations assumed by any public service corporation who is given and accepts the "Right of eminent domain."

Second—A study of a railway's relation to its stockholders.

Third—The relation of the national government and the methods of government regulation existing and proposed.

Fourth—Their relation to the state and the shipper, including the subjects of railway capital, income, expenditures, the basis of freight rates, freight classification and taxation. Prerequisites, Civil Engineering 510, 611, and 754. Three hours' credit. Recitations, two hours, and designing, three hours, per week.

836. Hydraulic Engineering. For those students who elect special work for the Senior year in Hydraulic Engineering. Hydraulic power development, water wheel, turbine, and impulse wheel installations are studied in their various details, the text book being Mead's "Water Power Engineering." In addition to the text-book work, considerable time is spent in reference work, studying from the current technical literature and preparing reports upon various existing power plants and other topics of interest along the same lines. Three hours per week are devoted to designing the various structures connected with hydraulic power plants—dams, pen-stocks, power canals, pipe lines, turbine installation and their regulation, etc. Estimates of cost of the structures designed are made. Prerequisite, M. E. 686. Credit, three hours. Recitations, two hours, and designing, three hours, per week.

839. Structural Engineering. For students who elect special work in Structural Engineering. This course is taught in conjunction with Civil Engineering 819 in a special class to students taking structural engineering, giving a total of five credit hours and is very much more thorough and complete, especially in "higher structures." Three hours' credit.

855. Water Supply Engineering. This course is the same as 822 with the omission of the designing. Two hours' credit.

Department of Electrical Engineering

FRED ALAN FISH, PROFESSOR.
ADOLPH SHANE, ASSOCIATE PROFESSOR.
MYRICK WHITING PULLEN, INSTRUCTOR.
BRUCE A. COLE, MECHANICIAN.

The Course.

It is recognized that the successful engineer of today must not only be well grounded in the fundamental principles of the sciences which underlie the practice of his profession, but he must possess also a sound training in language and literature, especially in the English language, and at least a working knowledge of history and the principles of economics. Training in these non-technical and cultural subjects is necessary, not only to give the engineer breadth of mind and the ability to meet, direct, and co-operate with men intelligently and with good effect, but also to enable him to express himself accurately and clearly and to make his technical training and knowledge of the greatest value to himself and his fellowmen. There seems to be a strong feeling among young men entering college that their course of study should be such as to enable them as soon as possible to command a good salary. While it may be admitted that for a short time after graduation the man who has given much the greater amount of his time to technical matters may secure larger financial rewards, it is believed that he can neither continue to cope successfully with the man who has had the broader training, nor come to be considered a really successful engineer.

Nevertheless, in response to the strong demand for technical work, a large part of the time in the course given here is devoted to such work. However, it is strongly urged that at least as much time and energy, hour for hour, be given to the non-technical studies as to the technical studies.

As a basis for those studies dealing directly with engineering, the sciences of Mathematics, Physics, and Chemistry are absolutely essential and must be given careful attention. Following these subjects, Mechanics and Materials of Construction are given before Electrical

Machinery and Electrical Engineering are taken up. In the earlier part of the course some time is given to Mechanical Drawing and Shop Work. During the last year and one-half, the greatest portion of the time is given to the theory, design, and operation of Electrical Machinery, and to Power Plants, Railways, and Electric Transmission; but, in recognition of the close alliance between Mechanical Engineering and Electrical Engineering, considerable time is also devoted to the former. Also, a course is given in Surveying.

The Equipment.

The fall of 1909 witnessed the installation of the Electrical Laboratory on the ground floor of the central portion of the New Engineering Annex. It occupies a space of 50x70 feet, is fireproof throughout and is provided with a system of covered trenches which carry all wires. The scheme of the laboratory has been carefully worked out with a view of obtaining the maximum amount of usefulness, with a minimum amount of waste of time on the part of the student. Few, if any, similar installations are superior in equipment and system. For experimental purposes there are twenty-eight generators and motors of various manufacture, several transformers, over one hundred accurate instruments, besides mounted lamp banks, rheostats, choke coils and other apparatus.

The principal machines are distributed as follows: The Substation Set, which, together with its switchboard, is situated in the center of the laboratory, consists of four machines on one base; a 100 horsepower, 3-phase, 60 cycle, 1,100-volt, 1,200-r. p. m. induction motor directly coupled to and driving the other three. The power for this machine comes in tunnels from the Central College power plant. On one end of the motor is coupled a 60-kilowatt, 125-volt, compound wound, direct current generator, supplying the necessary direct current power for the laboratory. On the other end is a 50-kilowatt, 3-phase, 60-cycle, 220 and 110-volt revolving field alternator with direct connected exciter, supplying the alternating current power.

Arranged around the laboratory are the smaller experimental machines, ranging from 6-kilowatt capacity to 7½-kilowatt or 10 horsepower. These are belted in sets of two, one of each acting as a driver for the other. They consist of direct current shunt, series, and compound wound machines, alternating current induction motors, a combination revolving field alternator and induction motor, either two, three, six or twelve-phase, double current generators, or rotary converters, arc light machines, etc. Controlling these sets are individual switchboards, mounted with instruments and control apparatus, but not connected up; the object being to put such practice into the hands of the student. In order to diminish waste of time in connecting up, the terminals of all machines and apparatus are brought to jacks of special form, devised at the Iowa State College, and circuits are made by plugs and cords of appropriate size.

In order to secure the necessary constant laboratory pressure, alternating and direct current Tirrill regulators are mounted on the Substation Switchboard. These are rather recent devices to obtain this end and serve the purpose admirably. To prevent one experimental machine from being influenced by changing load on another, the above scheme of individual drives has been adopted as distinguished from the line shaft method.

Nearly all the machines are of the latest design to insure a more nearly correct perspective of modern practice.

Connected with the laboratory at one end is a small workshop equipped with a motor driven engine lathe, a workbench, a grinder, and a complete set of carpenter and machinist tools for the repair and construction of apparatus. At the other end of the laboratory is the instrument room in which are kept the portable measuring instruments and other small apparatus.

In addition to the laboratory equipment, the department possesses a reflectoscope for the presentation of lantern slides and illustrations in the lecture room, also a considerable number of samples and models of electrical apparatus suitable for class room demonstrations.

COURSES IN ELECTRICAL ENGINEERING.

FOUR YEAR COURSE IN ELECTRICAL ENGINEERING.

This course leads to the degree of Bachelor of Science in Electrical Engineering. Graduates from this course may receive the full professional degree of Electrical Engineer by devoting one year to resident study and one year to a responsible engineering position and presentation of a satisfactory thesis or by five years' service in responsible engineering work and presentation of thesis.

N. B. Engineering Course Numbers.—The number in hundreds place indicates the semester in which the subject is taught. If the subject is also taught in a previous semester, the true course number is followed by the descriptive course number in parenthesis.

**Freshman Year.

FIRST SEMESTER.

		Required Semester hours
Mathematics 20,	Algebra	4
Mathematics 21,	Plane Trigonometry	1
Modern Languages		

The Language selected must be continued through the entire year.

				Required Semester hours
Choice	Language 18 or 57,	French	3	3
	Language 20 or 5a	German	3	
	Language 36 or 33,	Spanish	3	
	Literature 15,	English	3	

Students will be assigned to Modern Language courses under the following rules:

I. Students with four credits in a modern language:

1. Should continue the same language by taking Course 18, 36 or 20.

2. May take French 57 or Spanish 33, provided that satisfactory reasons for the change are presented to the Dean of the Junior College and the head of the Modern Language Department.

II. Students entering with two credits in German and two in Latin, will take German 5a.

III. Students entering with four credits in Latin may take Literature 15, French 57 or Spanish 33.

English 10,	Narration and Description	3
Chemistry 41,	General Chemistry	3
Mechanical Engineering 130,	Shop Work	2
Electrical Engineering 101,	Technical Lecture	
Mechanical Engineering 121,	Mechanical Drawing	2
Military 1,	Military Drill	
	Total semester hours	18

SECOND SEMESTER.

		Required Semester hours
Mathematics 22,	Trigonometry	2
Mathematics 23,	Analytical Geometry	3

Modern Languages

The Language selected must be a continuation of the one chosen in the first semester.

Choice	Language 19 or 58,	French	3	3
	Language 21 or 6a,	German	3	
	Language 37 or 34,	Spanish	3	
	Literature 16,	English	3	
	English 11,	Exposition		3
	Chemistry 42,	General Chemistry		3
	Mechanical Engineering 232,	Shop Work		2
	Electrical Engineering 202,	Technical Lecture		
	Mechanical Engineering 220,	Descriptive Geometry		2
	Military 2,	Military Drill		
		Total semester hours		18

**Freshmen who show deficient preparation in English or Mathematics may be assigned by the Dean of the Junior College and the Dean of Engineering to special classes, with one hour more work than indicated above, and in case of clear indication of failure in either of these subjects, even with this arrangement, they will be dropped from the Freshman work in this line until they have given proof of sufficient preparation to enable them to carry the work successfully.

Sophomore Year.

THIRD SEMESTER.

		Required Semester hours.
Mathematics 24,	Analytical Geometry	2
Mathematics 25,	Calculus	3
English 12,	Argumentation	2
Chemistry 43,	Qualitative Analysis	3
Physics 303,	Mechanics and Heat	5
Mechanical Engineering 331,	Shop Work	2
Mechanical Engineering 322,	Mechanical Drawing	1
Military 3, or Athletics		—
	Total semester hours	18
History 17,	The American People	1

To be taken in Sophomore or Junior year.

FOURTH SEMESTER.

		Required Semester hours.
Mathematics 26,	Differential and Integral Calculus	4
Chemistry 45,	Analytical Chemistry	2
Physics 404,	Electricity and Magnetism and Light and Sound	5
Mechanical Engineering 437,	Shop Work	1
Mechanical Engineering 439,	Shop Work	1
Mechanical Engineering 401,	Analytical Mechanics	3
Mechanical Engineering 423,	Mechanical Drawing	2
Military 4, or Athletics,		—
	Total semester hours	18
History 18,	American Statesmen	1

To be taken in Sophomore or Junior year.

Junior Year.

FIFTH SEMESTER.

		Required Semester hours.
Physics 506,	Electricity and Magnetism	3
Physics 514,	Physical Laboratory	2
Mechanical Engineering 502,	Analytical Mechanics	5
Mechanical Engineering 503,	Materials of Construction	3
Mechanical Engineering 533,	Shop Work	2
Mechanical Engineering 512,	Mechanical Engineering Laboratory	1
Mathematics 10,	Differential Equations	2
	Total semester hours	18

SIXTH SEMESTER.

		Required Semester hours.
Electrical Engineering 604,	Direct Current Machinery	4
Electrical Engineering 619,	Electrical Engineering Laboratory	1
Physics 607,	Theory of Alternating Currents	3
Physics 617,	Physical Laboratory	2
Mechanical Engineering 686,	Analytical Mechanics	4
Mechanical Engineering 685,	Machine Design	2
Mechanical Engineering 613,	Mechanical Engineering Laboratory	1
Engineering 603,	Conservation of Natural Resources	1
	Total semester hours	18

Senior Year.

SEVENTH SEMESTER.

		Required Semester hours.
Electrical Engineering 711,	Alternating Current Machinery	5
Electrical Engineering 720,	Electrical Engineering Laboratory	2
Electrical Engineering 724,	Electrical Engineering Design	2
Electrical Engineering 729,	Electrical Engineering Seminar	
Mechanical Engineering 784,	Steam Engines and Boilers	2
Engineering 702,	Specifications and Contracts	1
Civil Engineering 751,	Surveying	3
Economic Science 9,	Outlines of Economics	3
Electrical Engineering,	Thesis begun	
	Total semester hours	18

EIGHTH SEMESTER.

		Required Semester hours.
Electrical Engineering 816,	Electric Power Plants and Transmission	3
Electrical Engineering 809,	Electric Railways	3
Electrical Engineering 821,	Electrical Engineering Laboratory	2
Electrical Engineering 825,	Electrical Engineering Design	2
Electrical Engineering 830,	Electrical Engineering Seminar	
Electrical Engineering 840,	Electrical Engineering Thesis	4
Mechanical Engineering 809,	Constructive Engineering	3
Engineering 801,	History of Engineering	1
	Total semester hours	18

Optional:

Students obtaining the approval of the head of the department may classify, during any semester of the Junior or Senior years, in two hours of optional, technical or culture work. The following list is suggested: Bacteriology 4, Economic Science 12, English 8, History 7, 9, Horticulture 17, Languages 15, 16, 19, 20, Literature 13, 14, Public Speaking 17, and the courses in Industrial Chemistry.

FIVE-YEAR COURSE IN ELECTRICAL ENGINEERING.

The following five-year course in Electrical Engineering is offered in response to a demand for an engineering course giving the student a better education in the culture studies and the natural sciences, together with an opportunity to specialize along certain engineering lines not possible in the time available in the four-year course of study. The course includes all of the work given in the four-year course and in addition thirty hours of culture and scientific studies, together with four hours of work given in the engineering departments.

This course leads to the same degree granted to graduates of the four-year course, but a graduate may obtain the full professional degree of Electrical Engineer after one year of responsible professional work and the presentation of a satisfactory thesis.

N. B. Engineering Course Numbers.—The number in hundreds place indicates the semester in which the subject is taught. If the subject is also taught in a previous semester, the true course number is followed by the descriptive course number in parenthesis.

Freshman Year.

FIRST SEMESTER.

		Required Semester Hours.
Mathematics 20,	Algebra	4
Mathematics 21,	Plane Trigonometry	3

Modern Language

The Language selected must be continued through the entire year.

				Required Semester Hours.
Choice	Language 18 or 57,	French	3	3
	Language 20 or 5a,	German	3	
	Language 36 or 33,	Spanish	3	
	Literature 15,	English	3	

Students will be assigned to Modern Language courses under the following rules:

I. Students with four credits in a modern language:

1. Should continue the same language by taking Course 18, 36 or 20.

2. May take French 57 or Spanish 33, provided that satisfactory reasons for the change are presented to the Dean of the Junior College and the head of the Modern Language Department.

II. Students entering with two credits in German and two in Latin, will take German 5a.

III. Students entering with four credits in Latin may take Literature 15, French 57 or Spanish 33.

English 10,	Narration and Description	3
History 6,	French Revolution and XIXth Century	3
Mechanical Engineering 121,	Mechanical Drawing	2
Mechanical Engineering 130,	Forge Work	2
Electrical Engineering 101,	Technical Lecture	
Military 1,	Drill	
	Total semester hours	18

SECOND SEMESTER.

		Required Semester Hours.
Mathematics 22,	Trigonometry	2
Mathematics 23,	Analytical Geometry	3
Modern Language		

The Language selected must be a continuation of the one chosen in the first semester.

Choice	Language 19 or 58,	French	3	3
	Language 21 or 6a,	German	3	
	Language 37 or 34,	Spanish	3	
	Literature 16,	English	3	

English 11,	Exposition	3
History 4,	Division and Reunion, 1850-1876	3
Mechanical Engineering 220,	Descriptive Geometry	2
Mechanical Engineering 232,	Foundry	2
Electrical Engineering 202,	Technical Lecture	
Military 2,	Drill	
	Total semester hours	18

Sophomore Year.

THIRD SEMESTER.

		Required Semester Hours.
Mathematics 24,	Analytical Geometry	2
Mathematics 25,	Calculus	3
English 12,	Argumentation	2
Chemistry 2,	General Chemistry	5
Mechanical Engineering 322,	Mechanical Drawing	1
Mechanical Engineering 331,	Pattern Work	2
History 17,	The American People	1

Elective:	Non-technical Work	2
Military 3, or Athletics,		
	Total semester hours	18

FOURTH SEMESTER.

		Required Semester Hours.
Mathematics 26,	Differential and Integral Calculus	4
English 13,	Advanced Composition	2
Chemistry 5,	Qualitative Analysis	5
Mechanical Engineering 423,	Mechanical Drawing	2
Mechanical Engineering 437,	Pattern Work	1
Mechanical Engineering 439,	Pipe Fitting	1
Civics 6,	Actual Government	3
Military 4, or Athletics		
	Total semester hours	18

Junior Year.

FIFTH SEMESTER.

		Required Semester Hours.
Mathematics 10	Differential Equations	2
Physics 503 (303),	Mechanics and Heat	5
Economic Science 9,	Outlines of Economics	3
Civil Engineering 545 (345),	Surveying	2
Mechanical Engineering 533,	Machine Work	2
Literature 13,	Literature	2
Elective:	Non-technical Work	2
	Total semester hours	18

SIXTH SEMESTER.

		Required Semester Hours.
Physics 604 (404),	Electricity and Magnetism, Light and Sound	5
Economic Science 15,	Engineering Economics	3
Literature 14,	Literature	2
Mechanical Engineering 601 (401),	Analytical Mechanics	3
Mechanical Engineering 634	Machine Work	2
Civil Engineering 646 (446),	Surveying	2
History 18,	American Statesmen	1
	Total semester hours	18

Senior Year.

SEVENTH SEMESTER.

		Required Semester Hours.
Physics 706 (506),	Electricity and Magnetism	3
Physics 714 (514),	Physical Laboratory	2
Mechanical Engineering 702 (502),	Analytical Mechanics	5
Mechanical Engineering 703 (503),	Materials of Construction	3
Mechanical Engineering 712 (512),	Mechanical Engineering Laboratory	1
Elective:	Non-technical Work	4
	Total semester hours	18

EIGHTH SEMESTER.

		Required Semester Hours.
Physics 807 (607),	Theory of Alternating Currents	3
Physics 817 (617),	Physical Laboratory	2
Electrical Engineering 804 (604),	Direct Current Machinery	4
Electrical Engineering 819 (619),	Electrical Engineering Laboratory	1
Mechanical Engineering 889 (689),	Machine Design	2
Mechanical Engineering 806 (606),	Analytical Mechanics	4
Mechanical Engineering 813 (613),	Mechanical Engineering Laboratory	1
Engineering 803 (603),	Conservation of Natural Resources	1
	Total semester hours	18

Post Senior Year.

NINTH SEMESTER.

		Required Semester Hours.
Electrical Engineering 911 (711),	Alternating Current Machinery	5
Electrical Engineering 920 (720),	Electrical Engineering Laboratory	2
Electrical Engineering 924 (724),	Electrical Engineering Design	2

Electrical Engineering 929 (729),	Electrical Engineering Seminar	
Mechanical Engineering 984 (784),	Steam Engines and Boilers	2
Engineering 902 (702),	Specifications and Contracts	1
Geology 901 (501),	General Geology	4
Elective:		2
Electrical Engineering,	Thesis begun	
	Total semester hours	18

TENTH SEMESTER.

		Required Semester Hours.
Electrical Engineering 1009 (809),	Electric Railways	3
Electrical Engineering 1016 (816),	Power Plants and Transmission	3
Electrical Engineering 1021 (821),	Electrical Engineering Laboratory	2
Electrical Engineering 1025 (825),	Electrical Engineering Design	2
Electrical Engineering 1030 (830),	Electrical Engineering Seminar	
Electrical Engineering 1040 (840),	Electrical Engineering Thesis	4
Engineering 1001 (801),	History of Engineering	1
Elective:		3
	Total semester hours	18

COURSES IN ELECTRICAL ENGINEERING.

101. Technical Lecture. This course is taken in connection with required Shop Work. Elementary principles of Electrical Engineering. Three lectures of this course are given by the College Librarian in explanation of the catalogue system and the use of the reference books. One lecture per week.

202. Technical Lecture. This course is taken in connection with required Shop Work. Continuation of Electrical Engineering 101. One lecture per week.

503. Electric Power Transmission and Railways. An elementary study of the principles of electrical machinery and the transmission and distribution of power for industrial purposes, including electric railways. Prerequisites, Physics 303 and 404, and Mathematics 26. Two hours per week.

604. Direct Current Machinery. General theory of the direct current dynamo, the establishment of electro-motive forces by induction, the magnetic circuit, armature windings, characteristic curves, and the adaption of the different types of direct-current machinery to various commercial purposes. Prerequisite, Physics 506. Lectures and recitations, four hours per week.

610. Direct Current Machinery. Same topics as in Electrical Engineering 604, but with less detail. Prerequisite, Physics 506. Recitations, three hours per week.

619. Electrical Engineering Laboratory. Elementary experiments on direct current circuits, machines and instruments. Must be preceded by Physics 514 or 523 and accompanied or preceded by Physics 617 or 615 and Electrical Engineering 604 or 610. Laboratory, one period per week. Fee, $3.00.

711. Alternating Current Machinery. Study of alternating current generators, motors and transformers. Prerequisites, Physics 607 and Electrical Engineering 604 or 610. Lectures and recitations. Five hours per week.

712. Electric Power Transmission and Mining. A study of the application of electrical machinery to industrial purposes, including electrical transmission and mining. Prerequisites, Physics 303 and 404, and Mathematics 26. Lectures and recitations, three hours per week.

717. Electrical Engineering Laboratory. Study of direct current machinery. Prerequisite, Electrical Engineering 604 or 610. Laboratory, one period per week. Fee, $3.00.

720. Electrical Engineering Laboratory. Advanced study of direct current machinery operation and beginning study of alternating current circuits and instruments. Must be accompanied or preceded by Electrical Engineering 711. Prerequisites, Electrical Engineering 619, and 604 or 610, and Physics 607. Laboratory, two periods per week. Fee, $5.00.

724. Electrical Engineering Design. The design of direct current generators. Prerequisite, Electrical Engineering 604. One lecture and one afternoon per week.

729. Electrical Engineering Seminar. Consists of preparation, presentation and discussion of papers upon special assigned topics in Electrical Engineering.

809. Electric Railways. A study of electric railway systems and apparatus, including the design of feeders and trolleys and the determination of the proper equipment for a given service. Prerequisite, Electrical Engineering 711. Lectures and recitations, three hours per week.

815. Alternating Current Machinery. Same topics as Electrical Engineering 711, but with less detail. Prerequisite, Electrical Engineering 610. Lectures and recitations, three hours per week.

816. Electric Power Plants and Transmission. A study of the principles underlying the lay-out of power-house and switchboard circuits and of distributing systems, including the determination of the most economical size of conductors for such systems, taking into account current prices of materials, rates of interest and depreciation, and cost of power, also numerous original and practical problems illustrating the principles. Prerequisite, Electrical Engineering 711. Lectures and recitations, three hours per week.

818. Electrical Engineering Laboratory. Study of alternating current circuits and machinery. Prerequisite, Electrical Engineering 711. Must be accompanied by Electrical Engineering 815. Laboratory, one period per week. Fee, $3.00.

821. Electrical Engineering Laboratory. Continuation of Course 720. Study of alternating current generators and motors, and commercial transformers. Laboratory, two periods per week. Fee, $5.00.

825. Electrical Engineering Design. The design of alternating current generators and transformers. Prerequisite, Electrical Engineering 724. One lecture and one afternoon per week.

830. Electrical Engineering Seminar. Continuation of Course 729.

840. Electrical Engineering Thesis. Preparation of a thesis on some Electrical Engineering subject—the designing and construction of some electrical machine or measuring instrument, the efficiency test and critical study of some dynamo-electric machine or power plant, or of electrical research work of special direction. Four hours' credit per week.

Department of Physics and Illuminating Engineering

LOUIS BEVIER SPINNEY, PROFESSOR.

ARTHUR HENRY HOFFMAN AND WILLIAM BALLANTYNE ANDERSON, ASSISTANT PROFESSORS.

WILLIAM KUNERTH, HERBERT JOHN PLAGGE, AND WILLIAM ALFRED BEVAN, INSTRUCTORS.

Equipment.

The Physics lecture room is modern in its equipment, which includes lanterns and projectoscope and screens, and electric, gas and water connections, placing at the disposal of the lecturer water pressure, compressed air, and electric currents from storage batteries, and direct or alternating current dynamos. There is also a good equipment in apparatus for demonstration purposes, which is stored in apparatus rooms adjoining the lecture room.

The general laboratory rooms are large and well-lighted and are equipped with heavy oak tables, slate-top piers and wall tables with heavy stone tops for the support of the laboratory apparatus. Convenient electric, gas and water connections are provided. A very serviceable equipment in the apparatus used in general physical laboratory work is furnished. Among other apparatus may be mentioned a laboratory clock, with electric connections, a chronograph, a reversion pendulum, torsion pendulums for the experimental determination of "moment of inertia" and the "coefficient of simple rigidity," a physical pendulum, apparatus for the determination of the "intensity of gravity," analytical balances, Jolly's balance, hydrostatic balance, apparatus for the determination of "Young's Modulus," apparatus for the coefficient of linear expansion, a cathetometer, optical benches, telescopes and microscopes, spectroscopes, a saccharimeter, hydrometers, thermometers, barometers, galvanometers, Wheatstone bridges, "testing apparatus," electrocalorimeters, silver, copper and water coulombmeters, etc.

The photometry rooms are equipped with several photometer benches and are furnished with gas and electric connection. The arrangement of apparatus is made with a view of facilitating the regulation tests of arc and incandescent lamps as well as those of other sources of illumination.

Besides several ordinary photometers, the equipment includes a Matthew's Integrating Photometer, an Ulbricht sphere, a Sharp-Millar universal photometer, a storage battery of sixty 15 ampere cells, a recording voltmeter, a Weston standard voltmeter and the necessary portable voltmeters and ammeters.

The repair shop is fitted with an engine lathe, a speed drill, a set of machinist's and carpenter's tools and a stock of shop supplies. This room is used for the repair and manufacture of apparatus.

COURSES IN PHYSICS.

205. Mechanics, Heat and Light. A study of the fundamental principles of Physics and their applications. Lecture and recitations. Prerequisite, Mathematics 17. Three hours' credit. Fee for mimeograph notes, $1.50.

301. Mechanics and Heat. Includes study of mass, force, energy and power, also graphic methods of solving problems in force actions, velocities, etc., radiation in and wave motion; also general mechanics and heat. Prerequisites, Mathematics 4, 5 and 6. Three hours' credit. Recitations and lectures. Fee for mimeograph notes, $1.50.

303. Mechanics and Heat. Study of the fundamental principles of the work, also study of vector quantities and their treatment. A view of the subject from the mathematical standpoint is emphasized and the student is urged to familiarize himself with the theoretical side of the question, as it is believed that such a foundation is essential to the work which follows. Prerequisites, Mathematics 4, 5, and 6. Five hours' credit. Lectures three hours, recitation one hour, and laboratory one period per week. Fee, $3.50 (Laboratory, $2.00; notes, $1.50).

402. **Electricity and Magnetism and Light and Sound.** Includes study of electricity, magnetism, light and sound. This course together with course 301 is to meet the needs of the students in Domestic Economy. The breadth of the course, together with the emphasis which is placed upon the essentials, adapt it to the needs of teachers and others who desire a general training in physics. Prerequisite, Physics 301. Three hours' credit. Lectures and recitations. Fee for mimeograph notes, $1.50.

404. **Electricity and Magnetism and Light and Sound.** Prerequisite, Physics 303. Five hours' credit. Lectures three hours, recitation one hour, and laboratory one period per week. Fee, $3.50. (Laboratory, $2.00; notes, $1.50.)

506. **Electricity and Magnetism.** Elementary theory of electricity and magnetism; discussion of measuring instruments and laboratory methods of measuring various electrical quantities. Lectures, recitations, and problems. Text book, Franklin & McNutt's "Elements of Electricity and Magnetism." Prerequisites, Physics 303 and 404 and Mathematics 26. Three hours' credit.

511. **The Optics of Photography.** Optional in all courses (only upon recommendation by head of department in which student is taking his major work.) Lectures, one hour per week. Prerequisite, Physics 205 or 404.

514. **Physical Laboratory.** Measurement of length, mass and time, determination of physical constants, use of barometer, thermometry, calorimetry, etc. Prerequisites, Physics 303 and 404 and Mathematics 26. Laboratory, two periods per week. Fee, $5.00.

516. **Physical Laboratory.** Work as offered in Course 615. Laboratory, two periods a week. Fee, $5.00.

523. **Physical Laboratory.** Laboratory, one period per week. Fee, $3.00.

607. **Theory of Alternating Currents.** Prerequisites, Physics 506 and Mathematics 10. Lectures and recitations, three hours per week.

615. **Physical Laboratory.** Measurement of electro-motive force and internal resistance of primary and secondary batteries, use of Wheatstone's bridge, measurement of current, determination of galvanometer constants, high resistance measurements, insulation tests. Laboratory, one period per week. Fee, $3.00.

617. **Physical Laboratory.** Work as offered in Course 615. Laboratory, two periods per week. Fee, $5.00.

801. **Illumination.** This course includes a study of the principles

and practice of photometry; a comparison of commercial illuminants as to efficiency, color and distribution of light; and an investigation of the methods employed to determine the proper selection and location of illuminants for interior illumination, street lighting, etc. Prerequisite, Physics 514 or 523. Lectures, recitations and laboratory. Three hours per week.

Department of Mining Engineering

SAMUEL WALKER BEYER, PROFESSOR.

IRA ABRAHAM WILLIAMS, LAWRENCE C. HODSON, WILLIAM MILTON BARR, ASSOCIATE PROFESSORS.

CHARLES ELMER ELLIS, INSTRUCTOR.

EVERETT W. LAMBERT, GRADUATE-ASSISTANT.

The courses in Mining Engineering are planned to give the student a ready familiarity with the branches which form the ground work of science of Mining and Metallurgy. The Department of Mining Engineering aims to give him such a thorough training in the fundamentals as will enable him after graduation to acquire in a comparatively short time the practical experience absolutely necessary before he is fitted to assume positions of great responsibility in the mining industries. The department offers two courses, a four years', and a two years' course. The first is intended for those students who desire a "thorough course in Theoretical and Practical Mining," and underlying sciences, and leads to the degree of Bachelor of Science in Mining Engineering. The requirements for admission are the same as those for admission to the other Engineering courses. Students who pursue this course to completion are expected to be able to undertake the "full management of mining in its various branches," and become familiar with the principles involved and the methods employed in good mining engineering practice in general.

The latter course is designed for young men who have had some practical experience in mines, and wish to study mine surveying, drafting, the problems of ventilation, drainage, haulage, mine operation, etc., and also to learn something of the sciences which bear upon their work but have neither the time nor the preparation for a full college course. Elementary mathematics, drawing and shop work receive considerable attention during the first year, while the professional studies are reserved for the second year. Candidates who are twenty-one years of age or over are admitted without examination. All others must give evidence of a thorough grounding in the common branches.

Rooms and Equipment.

The Department of Mining Engineering occupies six rooms on the third floor of Engineering Hall and shares in common with the other Engineering departments the blue print, photographic, Engineering Museum and Assembly rooms. In addition to the rooms in Engineering Hall which are used for office, lecture, and museum purposes, the department has six rooms in the Engineering Annex and the Ceramics building providing rooms for the work in fire and wet assaying, dry and wet metallurgy, ceramics and clay working, ceramic and industrial chemistry, Engineering Experiment Station work along chemical, ceramic, mining, and metallurgical lines, stock and preparation rooms, offices, and a designing room.

Lecture Room and Laboratory in Mining Engineering.—This room is provided with seventy-five opera chairs with folding arm rests, a wall table cabinet occupying all of the outside wall space and so arranged as to provide excellent working space in front of the windows while the space between the windows is utilized for the filing of study material. Above the wall table, lockers with glass doors are provided, in which students may keep books and small pieces of apparatus free from dust. The windows are all provided with opaque shades and the room with a permanent lantern screen. The balance of the interior wall space is occupied by slate blackboards. A large cabinet lecture table completes the equipment of the room.

Seminar Room.—The seminar room is used for both laboratory and lecture purposes as in the case of the preceding, in addition to serving as a conference room and headquarters for the Junior and Senior students in Mining Engineering. It is equipped with two long tables standing at right angles to and directly connected with a large cabinet lecture table, the whole forming a continuous table in the form of a U. The room has a seating capacity of thirty-six and is equipped with movable revolving chairs, and slate blackboards on the interior walls. In addition the room contains a twenty-two tray filing case for large drawings, plats and maps, and a supply case.

The Museum.—The museum for Geology and Mining Engineering is fitted with eight museum cases with sloping glass tops and cabinet bases. The bases supply room for 192 trays in which the working collections and duplicate material in Geology and Minerology are filed. One large central case containing the larger casts of the "Ward Series," a series of cases, showcase tops and cabinet bases, occupy the space between the windows, and permanent cases occupy all the partition wall space.

Map Drawing and Designing Room.—This room is 23x25 feet on the second floor of Engineering Annex. It is well equipped with mine maps and working drawings covering the most important machines and apparatus used in mining and reduction works. General drawings showing the surface arrangements at a number of important mine and metallurgical plants are important parts of the equipment. The student furnishes his own drawing instruments, but such conveniences and necessities to mapping and designing as large steel straight edges, beam compasses, slide rules, and calculating machines, works of references, and trade catalogues are furnished by the department.

Surveying.—For field work in surveying the equipment is complete, comprising all the instruments and equipment necessary in making a complete surface and underground survey. An incomplete list includes a Queen Light Mountain Transit, two Berger No. 4 Light Mountain Transits with interchangeable side and top telescopes, an equatorial adaptor, enabling either instrument with its auxiliary telescope to be used as a solar compass, a Brunton and a Verschoyle Pocket Transit, Lamps, Tapes, etc.

Mine Investigation.—For this purpose the department is supplied with a complete Sullivan Diamond Drill prospecting outfit, a Water Leyner Air Drill, a complete set of miner's drills and tools, prospector's pans, picks, anemometers, barometers, clinometers, etc., and mine, geological, and topographical maps of the most important mining districts.

Wet Metallurgical Laboratory.—This laboratory is 24x30 feet on the second floor of Engineering Annex. A partial list of the equipment includes a Vizen Jig, Richards Pulsator Jig, classifiers of various kinds, screens, wet, dry, and vibratory, small Wilfley table, Magnetic Separator, Buddles, etc. In addition there is a good supply of tables, tanks, hose, glass ware, funnels, measuring apparatus, etc., so that temporary apparatus to illustrate the laws of settling and separation can be set up. This laboratory shares in the use of grinding machines and drying ovens placed for convenience elsewhere. With the apparatus listed and minor supplementary equipment, almost any problem in ore-dressing can be studied.

Dry Metallurgical Laboratory.—This laboratory is 13x25 feet, on the second floor of Engineering Annex. The main equipment embraces a small water-jacketed blast furnace, electric furnaces, electric pyrometer, calorimeter, tables, and a small desk equipment. It is intended to furnish this laboratory complete for the investigation of slags and their formation point, heat treatment of steels, and the behavior of metals, alloys, and ores so far as they can be studied on a comparatively small laboratory scale.

Rooms for Assaying.—Two rooms in the new Engineering Annex, each 24x18 feet, and a smaller room for balances and stores, have been set aside for the use of students in Mining Engineering. These rooms are fully equipped for all kinds of assay work. One room will be equipped with experiment desks and lockers for twenty-eight students with complete chemical equipment for ore analysis and blow-piping. The second room is thoroughly equipped with everything required for fire assaying. This equipment consists of one large wind furnace, one Bosworth muffle furnace, one multiple muffle furnace, three crucible furnaces, and three two-multiple furnaces, all for coal or coke, five Cary Combination gasoline furnaces, and one Cary Crucible furnace.

The weighing room contains assay and analytical balances mounted upon brick piers for the use of the two laboratories.

Location.—Ames is located conveniently to the Iowa coal fields and students have easy access to the coal mines of Boone and Polk counties. The great centers of the clay industry, Des Moines, Boone, and Fort Dodge, are equally accessible, while the quarries of Marshall county are scarcely more than an hour's ride from the College. These and numerous allied industries are, after all, the most important and indispensable laboratories for the practical mining engineer. The department undertakes to present the accepted theories concerning mineral aggregation, origin and occurrence, but these theories can be put to test only by an intelligent use of the drill, the level and the plane table. The accredited methods of winning the ores and minerals receive full discussion in the class room, but only render obvious the necessity of becoming familiar with the practical workings of the sluice box, the tipple and the stamp mill. The chemical and physical properties of a clay may be ascertained in the laboratory, but a complete knowledge of its properties and its mode of treatment can be gained only by following it from the pit to the street. In short, the department aims to give as complete an exposition of the theories and laws which underlie the science of mining as the time will permit, but the verification and application of these theories and laws must be made, in large measure, in the field and in the industries.

Research Work.—It is the settled policy of the department to carry on such investigation work as may be of benefit to the mining and manufacturing interests of the state. In cooperation with the other Engineering departments considerable work has been done and is being done on fuels, clays and structural materials. The department is also prepared to do a limited amount of assaying, test clays and fuels, do mine surveying, prepare mine maps and plats, examine and report on mine and clay properties for citizens of the state at reasonable cost. In fact, the atmosphere produced by *practical investigation work*, is believed to be necessary to the healthful growth of the engineer, and no opportunity is lost to encourage work along these lines.

Courses in Mining.—The work of the first two years in the four years' course in Mining Engineering is exactly the same as that required in the course in Mechanical Engineering, with the exception that Surveying takes the place of Mechanical Drawing, and the technical lecture is along mining engineering lines. The professional studies are given due prominence during the last two years of the course and the student is required to take continuous work in mining, chemistry and metallurgy, and geology, through the last three semesters. He is expected to make one of these branches the subject of special investigation and to embody the results of such investigation in a thesis, which is required of every student who is a candidate for graduation.

It is generally recognized that there is of necessity a considerable gap between the work included in the College curriculum and that of the professional engineer; and that the student in Engineering must gain the larger part of his professional training outside of college walls. The courses in summer field work are offered in the hope that his apprenticeship may be reduced to a minimum, and are required of all students in the four years' course in Mining Engineering.

COURSE IN MINING ENGINEERING.

FOUR YEAR COURSE IN MINING ENGINEERING.

This course leads to the degree of Bachelor of Science in Mining Engineering. Graduates from this course may receive the professional degree of Engineer of Mines by devoting an additional year to resident study and holding successfully a responsible engineering position for one year, on the presentation of a satisfactory thesis; or by five years' service in responsible engineering work and presentation of thesis.

N. B. Engineering Course Numbers.—The number in hundreds place indicates the semester in which the subject is taught. If the subject is also taught in a previous semester, the true course number is followed by the descriptive course number in parenthesis.

**Freshman Year.

FIRST SEMESTER.

		Required Semester Hours.
Mathematics 20,	Algebra	4
Mathematics 21,	Plane Trigonometry	1
Modern Languages		

The Language selected must be carried through the entire year.

Choice	Language 18 or 57,	French	3	3
	Language 20 or 5a,	German	3	
	Language 36 or 33,	Spanish	3	
	Literature 15,	English	3	

Students will be assigned to Modern Language courses under the following rules.

I. Students with four credits in a modern language:

1. Should continue the same language by taking Course 18, 36 or 20.

2. May take French 57 or Spanish 33, provided that satisfactory reasons for the change are presented to the Dean of the Junior College and the

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**Freshmen who show deficient preparation in English or Mathematics may be assigned by the Dean of the Junior College and the Dean of Engineering to special classes, with one hour more work than indicated above, and in case of clear indication of failure in either of these subjects, even with this arrangement, they will be dropped from the Freshman work in this line until they have given proof of sufficient preparation to enable them to carry the work successfully.

head of the Modern Language Department.

II. Students entering with two credits in German and two in Latin, will take German 5a.

III. Students entering with four credits in Latin may take Literature 15, French 57 or Spanish 33.

English 10,	Narration and Description	3
Chemistry 41,	General Chemistry	3
Mechanical Engineering 130,	Shop Work	2
Mining Engineering 101,	Principles of Mining	
Mechanical Engineering 121,	Mechanical Drawing	2
Military 1,	Military Drill	
	Total semester hours	18

SECOND SEMESTER.

		Required Semester Hours.
Mathematics 22,	Trigonometry	2
Mathematics 23,	Analytical Geometry	3
Modern Languages		

The Language selected must be a continuation of the one chosen in the first semester.

Choice			
Language 19 or 58,	French	3	3
Language 21 or 6a,	German	3	
Language 37 or 34,	Spanish	3	
Literature 16,	English	3	

English 11,	Exposition	3
Chemistry 42,	General Chemistry	3
Mechanical Engineering 231 (331),	Shop Work	2
Mining Engineering 220,	Principles of Mining	
Mechanical Engineering 220,	Descriptive Geometry	2
Military 2,	Military Drill	
Mining Engineering 212,	Summer field work	

Students who secure remunerative employment during their summer vacations between Freshman-Sophomore and Sophomore-Junior years will be excused from summer field work providing they are so employed for one month, subject to the approval of the head of the department.

Total semester hours 18

Sophomore Year.

THIRD SEMESTER.

		Required Semester Hours.
Mathematics 24,	Analytical Geometry	2
Mathematics 25,	Calculus	3

English 12,	Argumentation	2
Chemistry 43,	Qualitative Analysis	3
Physics 303,	Mechanics and Heat	5
Civil Engineering 345,	Surveying	2
Mechanical Engineering 322,	Mechanical Drawing	1
Mining Engineering 318,	Journal Club	
Military 3, or Athletics		
	Total semester hours	18
History 17,	The American People	1

To be taken in Sophomore or Junior year.

FOURTH SEMESTER.

		Required Semester Hours.
Mathematics 26,	Differential and Integral Calculus	4
Chemistry 46,	Elementary Quantitative Analysis	4
Physics 404,	Electricity and Magnetism and Light and Sound	5
Mechanical Engineering 401,	Analytical Mechanics	3
Civil Engineering 446,	Surveying	2
Mechanical Engineering 483,	Mechanical Drawing	1
Mining Engineering 419,	Journal Club	
Military 4, or Athletics		
Mining Engineering 423,	Summer field work	

Students who secure remunerative employment during their summer vacations between Freshman-Sophomore and Sophomore-Junior years will be excused from summer field work providing they are so employed for one month, subject to the approval of the head of the department

	Total semester hours	19
History 18,	American Statesmen	1

To be taken in Sophomore or Junior year.

Junior Year.

FIFTH SEMESTER.

		Required Semester Hours.
Mechanical Engineering 502,	Analytical Mechanics	5
Mining Engineering 510,	Mine Surveying and Mining Law	4
Geology 501,	Geology	4
Mining Engineering 530,	Assaying	4
Mechanical Engineering 512,	Mechanical Engineering Laboratory	1
Mining Engineering 506,	Seminar	
	Total semester hours	18

SIXTH SEMESTER.

		Required Semester Hours.
Mechanical Engineering 686,	Analytical Mechanics	4
Geology 607,	Geology	4
Mining Engineering 614,	Metallurgy	3
Mining Engineering 602,	Principles of Mining	3
Civil Engineering 656,	Structural Engineering	3
Engineering 603,	Conservation of Natural Resources	1
Mining Engineering 607,	Seminar	
Mining Engineering 613,	Summer field work	

Junior students who secure instructive employment in one of the great metal mining districts of the country will be excused from the Junior summer field work, providing they are so employed for at least six weeks, subject to the approval of the head of the department.

Total semester hours 18

Senior Year.

SEVENTH SEMESTER.

		Required Semester Hours.
Mining Engineering 715,	Metallurgy	5
Mining Engineering 703,	Principles of Mining	3
Geology 704,	Geology	4
Mechanical Engineering 784,	Steam Engines and Boilers	2
Engineering 702,	Specifications and Contracts	1
Electrical Engineering 712,	Electric Power Transmission and Mining	3
Mining Engineering 708,	Seminar	
Mining Engineering	Thesis begun	
	Total semester hours	18

EIGHTH SEMESTER.

			Required Semester Hours.
Mining Engineering 804,	Mining		5
Geology 805,	Geology		4
Engineering 801,	History of Engineering		1
Mechanical Engineering 809,	Constructive Engineering		3
Thesis work			
Choice **Mining Engineering 816,**	Special Work in Mining	5	5
Mining Engineering 817,	Special Work inMetallurgy	5	
Geology 808,	Special Work in Geology	5	
Mining Engineering 809,	Seminar		
	Total semester hours		18

Optional:

Students obtaining the approval of the head of the department may classify, during any semester of the Junior or Senior years, in two hours of optional, technical or culture work. The following list is suggested: Bacteriology 4, Economic Science 12, English 8, History 7, 9, Horticulture 17, Languages 15, 16, 19, 20, Literature 13, 14, Public Speaking 17, and the courses in Industrial Chemistry.

TWO YEAR COURSE IN MINING ENGINEERING.

First Year.

FIRST SEMESTER.

		Required Semester Hours.
Mathematics 3,	Algebra	5
Mathematics 5,	Plane Geometry	5
Chemistry 21,	Elementary Experimental Chemistry	5
Mechanical Engineering 121,	Mechanical Drawing	2
Mechanical Engineering 130,	Shop Work	2
Mining Engineering 101,	Principles of Mining	
	Total semester hours	19

SECOND SEMESTER.

		Required Semester Hours.
Mathematics 6,	Solid Geometry	2
Mathematics 30,	Plane Trigonometry	3
Chemistry 23,	Elementary Experimental Chemistry	5
Mining Engineering 602,	Principles of Mining	3
Civil Engineering 204,	Descriptive Geometry	2
Mechanical Engineering 331,	Shop Work	2
Mining Engineering 220,	Principles of Mining	
	Total semester hours	17

Second Year.

THIRD SEMESTER.

		Required Semester Hours.
Mining Engineering 530,	Assaying	4
Civil Engineering 345,	Surveying	2
Mining Engineering 703,	Principles of Mining	4

Physics 303,	Mechanics and Heat	5
Mining Engineering 506,	Seminar	
	Total semester hours	15

FOURTH SEMESTER.

		Required Semeste Hours.
Civil Engineering 446,	Surveying	2
Mining Engineering 804,	Mining Engineering	5
Mining Engineering 614,	Metallurgy	4
Geology 501,	General Geology	4
Mechanical Engineering 423,	Mechanical Drawing	2
Mining Engineering 607,	Seminar	
	Total semester hours	17

FIVE YEAR COURSE IN MINING ENGINEERING.

The following five year course in Mining Engineering is offered in response to a demand for an engineering course giving the student a better education in the culture studies and the natural sciences together with an opportunity to specialize along certain engineering lines not possible in the time available in the four year course of study. The course includes all of the work given in the four year course, and in addition affords opportunity to do more work along cultural and scientific lines during the first three years and to elect additional subjects given in the engineering departments during the last two years.

This course leads to the same degree granted to graduates of the four year course. A graduate of the five year course may obtain the full professional degree of Engineer of Mines after one year of responsible professional work and the presentation of a satisfactory thesis.

N. B. Engineering Course Numbers.—The number in hundreds place indicates the semester in which the subject is taught. If the subject is also taught in a previous semester, the true course number is followed by the descriptive course number in parenthesis.

Freshman Year.

FIRST SEMESTER.

			Required Semester Hours.
	Mathematics 20,	Algebra	4
	Mathematics 21,	Plane Trigonometry	1
	Modern Language		
	The Language selected must be continued through the year.		
Choice	Language 18 or 57,	French 3	3
	Language 20 or 5a,	German 3	
	Language 36 or 33,	Spanish 3	
	Literature 15,	English 3	

Students will be assigned to Modern Language courses under the following rules.

I. Students with four credits in a modern lauguage:

1. Should continue the same language by taking Course 18, 36 or 20.

2. May take French 57 or Spanish 33, provided that satisfactory reasons for the change are presented to the Dean of the Junior College and the head of the Modern Language Department.

II. Students entering with two credits in German and two in Latin, will take German 5a.

III. Students entering with four credits in Latin may take Literature 15, French 57 or Spanish 33.

English 10,	Narration and Description	3
History 6,	French Revolution and XIXth Century	3
Mechanical Engineering 121,	Mechanical Drawing	2
Mechanical Engineering 130,	Forge Work	2
Mining Engineering 101,	Technical Lecture	
Military 1	Drill	
	Total semester hours	18

SECOND SEMESTER.

		Required Semester Hours.
Mathematics 22,	Trigonometry	2
Mathematics 23,	Analytical Geometry	3
Modern Language		

The Language selected must be a continuation of the one chosen in the first semester.

Choice	Language 19 or 58,	French 3	3
	Language 21 or 6a	German 3	
	Language 37 or 34,	Spanish 3	
	Literature 16,	English 3	
	English 11,	Exposition	3
	Mechanical Engineering 220,	Descriptive Geometry	2
	Mechanical Engineering 231,	Wood Shop	2
	History 4,	Division and Reunion, 1850 to 1879	3
	Mining Engineering 220,	Technical Lecture	
	Military 2,	Drill	
	Mining Engineering 212,	Summer Field Work	
		Total semester hours	18

Sophomore Year.

THIRD SEMESTER.

		Required Semester Hours.
Mathematics 24,	Analytical Geometry	2
Mathematics 25,	Calculus	3
English 12,	Argumentation	2
Chemistry 2,	General Chemistry	5
Civil Engineering 308,	Surveying	4
Mechanical Engineering 322,	Mechanical Drawing	1
Military 3, or Athletics		
Elective	Non-technical Work	1
	Total semester hours	18

FOURTH SEMESTER.

		Required Semester Hours.
Mathematics 26,	Differential and Integral Calculus	4
English 13,	Advanced Composition	2
Chemistry 5,	Qualitative Analysis	5
Mechanical Engineering 423,	Mechanical Drawing	2
Civil Engineering 409,	Surveying	4
Military 4, or Athletics		
Elective	Non-technical Work	1
Mining Engineering 423,	Summer Field Work	
	Total semester hours	18

Junior Year.

FIFTH SEMESTER.

		Required Semester Hours.
Physics 503 (303),	Mechanics and Heat	5
Economic Science 9,	Outlines of Economics	3
Mining Engineering 510,	Mine Surveying	4
Chemistry 50,	Analytic Chemistry	5
Mechanical Engineering 583, (483),	Drawing	1
Mining Engineering 506,	Seminar	
	Total semester hours	18

SIXTH SEMESTER.

Required Semester Hours.

Physics 604 (404),	Electricity and Magnetism and Light and Sound	5
Economic Science 15,	Engineering Economics	3
Mechanical Engineering 601 (401),	Analytical Mechanics	3
Geology 607 (501),	Mineralogy	4
Mining Engineering 618,	Assaying	3
Mining Engineering 607 (507),	Seminar	
Mining Engineering 613,	Summer Field Work	
	Total semester hours	18

Senior Year.

SEVENTH SEMESTER.

		Required Semester Hours.
Mechanical Engineering 702 (502),	Analytical Mechanics	5
Electrical Engineering 712,	Electric Power Transmission and Mining	3
Physics 723 (523),	Physical Laboratory	1
Geology 701 (501),	General Geology	4
Mining Engineering 708,	Seminar	
Elective		5
	Total semester hours	18

EIGHTH SEMESTER.

		Required Semester Hours.
Mechanical Engineering 886 (686),	Analytical Mechanics	4
Civil Engineering 811 (611),	Structural Engineering	4
Geology 2	Stratagraphic and Historical Geology	3
Mining Engineering 802 (602),	Mining Engineering	3
Mining Engineering 814 (614),	Metallurgy	3
Mining Engineering 809,	Seminar	
Engineering 803 (603),	Conservation of Natural Resources	1
	Total semester hours	18

Post Senior Year.

NINTH SEMESTER.

		Required Semester Hours.
Mining Engineering 903 (703),	Mining Engineering	4
Mechanical Engineering 984 (784),	Steam Engines and Boilers	2
Engineering 902 (702),	Specifications and Contracts	1
Geology 904 (704),	Petrologic Geology	4
Mining Engineering 915 (715),	Metallurgy	5
Elective		2
Mining Engineering 919,	Seminar	
	Total semester hours	18

TENTH SEMESTER.

		Required Semester Hours.
Engineering 1001 (801),	History of Engineering	1
Civil Engineering 1022 (822),	Water Supply Engineering	3
Civil Engineering 1015 (615),	Engineering Laboratory	1
Geology 1005 (805),	Economic Geology	4
Mining Engineering 1017 (817),	Special Work in Mining, Metallurgy or Geology	5
Elective		4
Mining Engineering 1020,	Seminar	
	Total semester hours	18

COURSES IN MINING ENGINEERING.

101. Principles of Mining. This course is taken in connection with the required Shop Work. The student receives instruction in the general and elementary principles of mining in order that he may appreciate something of what he sees and hears before he makes a detailed study of prospecting, exploration, mining methods, and the various subjects included in Courses 602, 703 and 804. Special attention given to mining terms and local mining methods. Three lectures of this course are given by the College Librarian in explanation of the catalogue system and the use of reference books.

212. Summer Field Work in Mine Surveying. Two weeks' work required at the close of the Freshman year. The work is carried on in one of the coal mining districts of the state and comprises the complete survey of a mine and a thorough examination of the equipment and mode of operation of a typical mine for the district, and leads in the first place to a mine map, and in the second to a careful report on mine property accompanied by the necessary illustrations.

220. Principles of Mining. A continuation of Course 101, taken in connection with the required Shop Work. The Mining and Metallurgical operations to be seen while on the succeeding Summer Field Trip are studied with as much detail as the time and student's preparation permit.

318. Journal Club. The work consists of weekly conferences with one or more of the instructors in the department, in which the leading mining journals receive principal attention. Lectures are given occasionally on current topics and the students are encouraged to acquire the habit of reading the technical journals which are to be found on the library shelves.

419. Journal Club. See Course 318. Continuation of 318.

423. Summer Field Work in Mine Surveying. Two weeks' work required at the close of the Sophomore year. The work is carried on in one of the coal mining districts of the state, and comprises the complete survey of a mine and a thorough examination of the equipment and mode of operation of a typical mine for the district, and leads in the first place to a mine map, and in the second to a careful report on mine property accompanied by the necessary illustrations.

506. Seminar. For the purpose of bringing together the Junior and Senior students and the members of the instructing corps for weekly conferences. A discussion of timely topics by the students.

510. Mine Surveying and Mining Law. Supplements the work in surveying taken in the Civil Engineering Department. Methods of surveying especially adapted to mines and tunnels. The use of the auxiliary telescope and the various problems met with in underground surveying are illustrated by means of problems taken from actual practice. Also Mineral Land Surveying. As the subject of Mineral Land Surveying necessarily requires some knowledge of the law relating to mining claims, the whole subject of Mining, Mineral and Geological Law is given a rapid review. While an exhaustive study of such laws is impossible the necessity of some knowledge of the law is impressed upon the student and he is shown where he can obtain information on the simpler questions. Recitations, four hours per week.

530. Assaying. The analysis of ores and metallurgical products by wet methods and by fire assaying. The work includes assays of ores of lead, tin, gold, silver, copper, zinc, mercury, bismuth, and antimony, and the assay of bullion. Text-books, Fulton's Manual of Fire Assaying, and Low's Technical Methods of Ore Analysis. Recitations and laboratory work. Four hours' credit.

602. Principles of Mining. Study of methods employed in excavating, boring and shaft sinking, mining and the support of mine excavations; also critical study of methods employed in exploration, development and mine working in general. Recitations, three hours per week.

607. Seminar. Continuation of Course 506.

613. Summer Field Work in the Study of Mine Operation and Equipment, and of Concentrating Plants. Four weeks' work required of students who have completed the Junior year. This course necessitates a visit to one of the great metal producing centers outside of the state. A careful study of mine properties is made, and a detailed report, properly illustrated by sketches and drawings, is required. A portion of the time is devoted to a study of ore dressing and concentrating plants.

614. Metallurgy. Study of refractory materials, fluxes, fuels and furnaces and the metallurgy of iron and steel; also pyrometry, calorimetry, fire clays and coke; the various metallurgical furnaces studied from working drawings; also an introduction to the science of metallography. Recitations, three hours per week.

618. Assaying. Three hours' credit.

703. Principles of Mining. Continuation of Course 602, with special reference to Mining Machinery. The subjects of Haulage, Hoisting, Ventilation, Air Compressors, etc., are studied with as much detail as time permits. Recitations, three hours per week.

708. Seminar. Continuation of Courses 506 and 607.

715. Metallurgy. Study of processes relating to copper, gold, lead, silver and zinc. In the time allotted to the work, a study of metallurgy of all the metals could not be made satisfactorily, and it is deemed best to confine the work to the most important metals and the most important processes. Recitations, five hours per week.

804. Mining Engineering. Ore dressing, amalgamation, cyanidation, mine buildings and general equipment and administration of mines. Recitations and lectures, five hours per week.

809. Seminar. Continuation of Courses 506, 607 and 708.

816. Mining Engineering. Mine Examinations and Reports, Mine Accounting, Mine Plant Design. A comparative study of Mine Plants, New Concentration Methods, etc. These and kindred subjects will be taken up, though not all during any one year. Instruction by means of lectures, assigned reading and reports. After preliminary work of this character, the student will be required to make designs and reports covering given problems. Students electing this work will be expected to write their graduating theses on subjects introduced in this course. Five hours per week.

817. Metallurgy. Intended for students who desire to specialize as much as possible in metallurgy. The subjects will be varied from year to year to suit the needs of the individual students. Instruction given by means of assigned readings, conferences and reports carried on simultaneously with work in the laboratory. Those electing this work will be required to write their graduating theses on subjects introduced in this course. Five hours per week.

919. Seminar.

1020. Seminar.

COURSES IN GEOLOGY.

501. General Geology: Dynamic, Structural and Physiographic Geology. This course includes a study of the principles which form the groundwork of the Science and is given by means of recitations, lectures, laboratory and field work. Counts four hours per week, three of which are devoted to recitations and lectures, and one to laboratory and field work. Prerequisites, one or more semesters each of Chemistry and Physics.

607. Mineralogy. The first half of the term is devoted to a study of the morphological and physical characters of crystalline substances, while the last half is devoted to descriptive and determinative mineralogy. The course counts four hours and consists of four two-hour sessions. Prerequisites, elementary courses in Mathematics, Chemistry and Physics.

704. Petrologic and Advanced Structural Geology. The first ten weeks of the term are devoted to the study of rocks, their origin, occurrence and association, and the last six weeks to a discussion of principles and problems in Structural Geology. The course counts four hours per week and includes three hours' class work and one laboratory or field period per week. Prerequisites, Geology 501 or 803. Four hours' credit.

803. Engineering Geology. The course includes a discussion of the fundamental principles of dynamic and structural geology and a study of the common minerals and rocks, especially those important in structural materials. Counts three hours per week and consists of recitations, lectures, laboratory and field work. Prerequisites, Elementary Chemistry, Mechanics and Heat.

805. Economic Geology. The first ten weeks includes a study of the non-metallics, while the remainder of the term is devoted to a study of the ore deposits of the United States, Canada, and Mexico. Especial stress is put upon the principles which govern the mode of occurrence, association and origin of the leading economic products. Prerequisites, Geology 501 or 803, and 704. Counts four hours and consists of three recitations and one laboratory or field period per week. Four hours' credit.

808. Thesis. Students in Mining Engineering electing to write a thesis in geology are required to take five hours' special work in geology during the second semester Senior year. This special work may be along any one of the following lines: Economic Geology, Petrology, Dynamic Geology, Structural Geology, Metamorphism, Historical Geology or Stratagraphic Geology.

CERAMICS AND CLAY WORKING.

The Department of Ceramics is established in the College in response to a growing demand for instruction in the silicate industries. The continued development of the clay working interests and the notable recent expansion along all lines of the cement industry have created a demand for technically educated men who are equipped to take the lead in the utilization of the silicate raw materials. Inquiries for qualified men along these lines have come from various sources, but at the present time the demand is far greater than the supply.

The term "Ceramics" has come to include within its scope the several phases of that branch of engineering which has to do with the investigation and development of all materials which enter into any of the silicate products. Besides clay and cement, therefore, glass-making, sandlime brick manufacture, and all mortar work into which natural silicates or silicate forming processes enter are properly embraced in the definition of the word.

The ceramic processes proper are pre-eminently a phase of chemical engineering and depend upon the principles of technical chemistry. Along with this application of chemical principles must go, however, a thorough familiarity with good mechanical engineering practice and in this line a knowledge of surveying and the principles of electricity is also essential. The ceramist must likewise possess a knowledge of geology which will enable him to intelligently prospect for raw materials and to take advantage of geological features in their utilization. An acquaintance with metallurgical principles, especially those relating to the value of fuels and their combustion and the properties of slags is indispensable, for upon the application of this knowledge may frequently depend the success or failure of large enterprises.

It is the design of the course in Ceramics to prepare and equip engineers to (a) intelligently exploit deposits of suitable raw materials, (b) to comprehend and apply economical methods to the winning of such materials, (c) to design and put into operation plants for their utilization and, (d) to take responsible charge of any and all technical processes connected with the manufacture of the finished products. To accomplish this, not only are the principles laid down in the class room and theories explained, but these principles and theories are verified and applied in the laboratory and in the field. Students are also required to study the methods employed in some of the leading establishments of the state and are encouraged to spend their vacations in practical work at some of these plants.

The Iowa Brick and Tile Association, while in session at Sioux City in 1899, passed a resolution requesting the trustees of the College to take up the investigation of the clays and the clay industries of the state. Similar resolutions were passed at each succeeding annual convention of the association. In 1906 both the Iowa Brick and Tile Association and the Iowa Cement Users' Association passed resolutions favoring the establishment of a "School of Ceramics" and providing for the investigation of the raw materials available for the silicate industries. Each organization appointed a committee to take the matter before the legislature then in session and secure the necessary legislation.

After a conference of the joint committee in Des Moines the following bill was prepared, presented to the legislature, and passed by that body:

To provide for the establishment of a course of practical and scientific instruction and investigation in the art of clay working and ceramics including the manufacture and use of cements and allied industries in the Iowa State College of Agriculture and Mechanic Arts.

Section 1. Be it enacted by the general assembly of the State of Iowa that the Trustees of the Iowa State College of Agriculture and Mechanic Arts be, and are hereby required to establish in said college a department of ceramics for the technical and practical education of clay workers, cement manufacturers and other allied pursuits in all branches of those arts which exist in this state and can be profitably introduced and maintained in this state from the mineral resources thereof; including the geology and properties of clays, cement materials, fuels, and other minerals required, and the testing of the products thereof; also the manufacture of fire brick, pressed brick, paving brick, and the glazed and enameled brick of all kinds, of sewer pipe, drain tile, fire proofing and terra cotta, of pottery, porcelain, china, and other specialties; also including the details of the manufacture and uses of cement and the details of other allied industries.

Section 2. Be it further enacted, that the said College shall provide as a part of its Engineering Experiment Station work for the investigation of clays, cement materials, fuels, anl other mineral resources of the state with especial reference to their economic uses, and for the publication and dissemination of information useful to such industries and for testing the products thereof.

At the 1907 and 1908 meetings of the Brick and Tile Association and the Iowa Association of Cement Users, strong resolutions were again passed favoring the development of ceramic investigations ana the support by the state of a department of instruction in this line of work.

In accordance with the spirit of the act establishing the department it is the desire to continue in co-operation with the Engineering Experiment Station the investigation of promising deposits of raw materials in different parts of the state. It is the policy of the department to serve the interests of the people of the state and to carry on such experiments as may seem required to determine the suitability of materials that appear to be available for any ceramic purpose.

Ceramics Building.

The new ceramics building, erected in conjunction with the recently completed Engineering Annex, is designed to meet the immediate needs of the ceramic work. It is a substantial brick building 50x70 feet and two and one-half stories in height, forming a right angle with the Annex which it joins at the south end. This structure, with two floors of equal width in the Annex proper, render available for the work in ceramics, metallurgy and industrial chemistry practically a two and one-half story building 120x50 feet.

On the first floor of the ceramics addition, laboratories are provided for ceramic and industrial chemistry and for the physical testing of clays, cement, and other ceramic raw materials; also rooms for kilns, dryers, packing and storage of supplies, and a room for dry grinding and crushing. There is also an office on this floor. On the second floor are set apart rooms for pyrometry, gas, fuel and water analysis, besides laboratories for clay and cement research, and for the temporary use of the Engineering Experiment Station. The ceramics museum, a room for dry metallurgical work, and an office are also on the second floor.

The individual laboratories are being thoroughly equipped with the necessary apparatus for carrying on all lines of ceramic instruction and investigation. The main clay working room is located in the Engineering Annex and is 30x23 feet. This laboratory is equipped with a small auger machine for making brick and block, drain, roofing and floor tile, a potter's turning wheel, filter press, double blunger, hand power press for dry press brick and floor and wall tile, and a series of ball mills. As an adjunct to the main ceramic laboratory and for the preparation of dry materials for assaying and metallurgy as well, the dry grinding room contains a dry pan, laboratory crushers, and a Sturtevant grinder.

The kiln room, in the northwest corner of the first floor is a little over 14x20 feet and affords space for both an up and a down draft experimental kiln using solid fuel, and a pottery kiln in which oil is burned. Separate outside concrete bins opening into this room are provided for coal, coke, and wood. Next to the kilns is the dryer and physical testing room in which are a small gas heated drying oven and benches equipped with the necessary utensils for making up and testing the physical properties of clays and other ceramic materials. The dimensions of this room are 20 feet, 7 inches, by 14 feet. Investigations of special technical problems in the ceramic fields are carried on in the research laboratories which are provided with the usual pieces of chemical apparatus and furniture, besides special equipment for specific investigations.

The laboratory for pyrometry and gas and fuel testing is in the northwest corner of the second floor directly above the kiln room. This location is convenient also for sampling and testing the flue gases from the kilns below and for making temperature observations. The equipment for this work includes an improved Elliott apparatus for gas analysis, Parr calorimeter for solid fuels, Junker calorimeter for gas and oils, Le Chatelier electric, and a Wanner optical pyrometer.

The ceramic museum is for the display of representative raw materials and finished products from all of the ceramic industries.

Rooms have been provided in the new Ceramics Addition for the temporary use of the Engineering Experiment Station. These consist of one large laboratory for general chemical analysis, special rooms for water and fuel analysis, and an office room for the chemist in charge. These rooms are fitted with all the apparatus necessary for carrying on the chemical work of the Experiment Station, and the special rooms, while primarily for station work, will be open for use by advanced students. A room for ceramic chemistry is provided with desks and all necessary laboratory equipment for the analysis of clay, cement, and ceramic products, and will be open only to students in ceramics. A balance room is attached to this laboratory.

A large, well-lighted room in the Ceramics Addition has been reserved for industrial chemistry. It is planned to fit this room with the mechanical appliances necessary for the student in technical chemistry, as well as such regular laboratory apparatus as is found in industrial laboratories.

Courses in Ceramics.

Two courses are offered in Ceramics; a two-year and a four-year course. The shorter course is the equivalent of the short course in Mining Engineering while the longer course is co-ordinate with the four-year courses offered in Mechanical, Civil, Electrical, and Mining Engineering.

COURSE IN CERAMICS.

**Freshman Year.

FIRST SEMESTER.

		Required Semester Hours.
Mathematics 20,	Algebra	4
Mathematics 21,	Plane Trigonometry	1
Modern Languages		

The Language selected must be continued through the entire year.

Choice	Language 18 or 57	French	3	3
	Language 20 or 5a	German	3	
	Language 36 or 33	Spanish	3	
	Literature 15	English	3	

Students will be assigned to Modern Language courses under the following rules:

I. Students with four credits in a modern language;

1. Should continue the same language by taking Courses 18, 36 or 20.

2. May take French 57 or Spanish 33, provided that satisfactory reasons for the change are presented to the Dean of the Junior College and the head of the Modern Language Department.

II. Students entering with two credits in German and two in Latin, will take German 5a.

III. Students entering with four credits in Latin may take Literature 15, French 57 or Spanish 33.

English 10,	Narration and Description	3
Chemistry 41,	General Chemistry	3
Mechanical Engineering 130,	Shop Work	2
Mechanical Engineering 121,	Mechanical Drawing	2
Mining Engineering 101,	Principles of Mining	
Military 1,	Military Drill	
	Total semester hours	18

SECOND SEMESTER.

			Required Semester Hours.
	Mathematics 22,	Trigonometry	2
	Mathematics 23,	Analytical Geometry	3
	Modern Languages		
	The Language selected must be a continuation of the one chosen in the first semester.		
Choice	Language 19 or 58,	French 3	3
	Language 21 or 6a,	German 3	
	Language 37 or 34,	Spanish 3	
	Literature 16,	English 3	
	English 11,	Exposition	3
	Chemistry 42,	General Chemistry	3
	Mechanical Engineering 231 (331),	Shop Work	2
	Mining Engineering 220,	Principles of Mining	
	Mechanical Engineering 220,	Descriptive Geometry	2
	Miltary 2,	Military Drill	
	Mining Engineering 212,	Summer Field Work	

**Freshmen who show deficient preparation in English or Mathematics may be assigned by the Dean of the Junior College and the Dean of Engineering, to special classes, with one hour more work than indicated above, and in case of clear indication of failure in either of these subjects, even with this arrangement, they will be dropped from the Freshman work in this line until they have given proof of sufficient preparation to enable them to carry the work successfully.

Students who secure remunerative employment in the silicate industries during their summer vacation will be excused from summer field work, providing they are so employed for one month, subject to the approval of the head of the department. —

Total semester hours 18

Sophomore Year.

THIRD SEMESTER.

		Required Semester Hours.
Mathematics 24,	Analytical Geometry	2
Mathematics 25,	Calculus	3
English 12,	Argumentation	2
Chemistry 43,	Qualitative Analysis	3
Physics 303,	Mechanics and Heat	5
Civil Engineering 345,	Surveying	2
Mechanical Engineering 322,	Mechanical Drawing	1
Mining Engineering 318,	Journal Club	
Military 3, or Athletics		—
	Total semester hours	18
History 17,	The American People	1

To be taken in the Sophomore or Junior year.

FOURTH SEMESTER.

		Required Semester Hours.
Mathematics 26,	Differential and Integral Calculus	4
Chemistry 46,	Elementary Quantitative Analysis	4
Physics 404,	Electricity and Magnetism and Light and Sound	5
Civil Engineering 446,	Surveying	2
Mechanical Engineering 401,	Analytical Mechanics	3
Mechanical Engineering 483,	Mechanical Drawing	1
Mining Engineering 419,	Journal Club	
Military 4, or Athletics		
Mining Engineering 423,	Summer Field Work	

Students who secure remunerative employment in the silicate industries during their summer vacation will be excused from summer field work, providing they are so employed for one month, subject to the approval of the head of the department. —

	Total semester hours	19
History 18,	American Statesmen	1

To be taken in the Sophomore or Junior year.

Junior Year.

FIFTH SEMESTER.

		Required Semester Hours.
Mechanical Engineering 502,	Analytical Mechanics	5
Ceramics 501,	Ceramic Chemistry	5
Geology 501,	General Geology	4
Mechanical Engineering 503,	Materials of Construction	3
Physics 523,	Physical Laboratory	1
Mining Engineering 506,	Seminar	
	Total semester hours	18

SIXTH SEMESTER.

		Required Semester Hours.
Mechanical Engineering 686,	Analytical Mechanics	4
Ceramics 602,	Ceramics	5
Civil Engineering 656,	Structural Engineering	3
Mining Engineering 614,	Metallurgy	3
Engineering 603,	Conservation of Natural Resources	1
Mechanical Engineering 613,	Engineering Laboratory	1
Mining Engineering 607,	Seminar	
Mining Engineering 613,	Summer Field Work	

Junior students who secure instructive employment in one of the great clay working or cement manufacturing districts of the country will be excused from the Junior summer field work, providing they are so employed for at least six weeks, subject to the approval of the head of the department.

	Total semester hours	17

Senior Year.

SEVENTH SEMESTER.

		Required Semester Hours.
Ceramics 704,	Ceramics	5
Ceramics 703,	Ceramic Chemistry	5
Geology 704,	Geology	4
Mechanical Engineering 784,	Steam Engines and Boilers	2
Engineering 702,	Specifications and Contracts	1
Ceramics 705,	Ceramics	1
Mining Engineering 708,	Seminar	
	Total semester hours	18

EIGHTH SEMESTER.

		Required Semester Hours.
Ceramics 806,	Ceramics	5
Mechanical Engineering 809,	Constructive Engineering	3
Geology 805,	Geology	4
Engineering 801,	History of Engineering	1
Ceramics 807,	Special and Thesis	5
Mining Engineering 809,	Seminar	
	Total semester hours	18

Optional:

Students obtaining the approval of the head of the department may classify, during any semester of the Junior or Senior years, in two hours of optional technical or culture work. The following list is suggested: Bacteriology 4, Economic Science 12, English 8, History 7, 9, Horticulture 17, Languages 15, 16, 19, 20, Literature 13, 14, Public Speaking 17, and the courses in Industrial Chemistry.

Two-Year Course in Clay Working.

The short course in clay working is designed to accommodate men already engaged in practice who may not have at their disposal sufficient time to take the four-year course or who may not have had the opportunity to prepare themselves to meet the entrance requirements to the long course. It aims to equip such persons for advancement by presenting the essential principles of the various operations involved in the production of clay wares. The several subjects treated in this course are arranged in sequential order and as far as possible the principles discussed in the class room are verified in the laboratory and the field. The preliminary studies of the first year are essential as a foundation for the understanding and prosecution of the more specialized work of the last two semesters. This course is planned to render the same sort of service to clay-workers as does the two-year course in Mining Engineering to practical miners.

TWO-YEAR COURSE IN CLAY WORKING.

First Year.

FIRST SEMESTER.

		Required Semester Hours.
Mathematics 3,	Algebra	5
Mathematics 5,	Plane Geometry	5
Chemistry 21,	Elementary Experimental Chemistry	5
Mechanical Engineering 121,	Mechanical Drawing	2

Mechanical Engineering 130,	Shop Work	2
Mining Engineering 101,	Principles of Mining	
	Total semester hours	19

SECOND SEMESTER.

		Required Semester Hours.
Mathematics 6,	Solid Geometry	2
Mathematics 30,	Plane Trigonometry	3
Chemistry 23,	Elementary Experimental Chemistry,	5
Ceramics 602,	Ceramics	4
Mechanical Engineering 220,	Descriptive Geometry	2
Mechanical Engineering 231 (331),	Shop Work	2
Mining Engineering 220,	Principles of Mining	
	Total semester hours	18

Second Year.

THIRD SEMESTER.

		Required Semester Hours.
Ceramics 501,	Ceramic Chemistry	5
Ceramics 704,	Ceramics	5
Physics 303,	Mechanics and Heat	5
Civil Engineering 345,	Surveying	2
Mining Engineering 506,	Seminar	
	Total semester hours	17

FOURTH SEMESTER.

		Required Semester Hours.
Ceramics 703,	Ceramic Chemistry	5
Ceramics 806,	Ceramics	5
Geology 501,	General Geology	4
Civil Engineering 446,	Surveying	2
Mechanical Engineering 423,	Mechanical Drawing	2
Mining Engineering 607,	Seminar	
	Total semester hours	18

COURSES IN CERAMICS.

501. Ceramic Chemistry. Quantitative analysis of raw materials used in the clay and cement industries. Especial attention is given to silicate minerals, beginning with those of simpler composition and progressing as far as possible in the analysis of the more complex clays, feldspar, etc. Five hours' credit. Recitation, two hours, and three laboratories per week.

602. Ceramics. Classification, properties and methods of winning clays and other materials used in the ceramic industries. Laboratory work in clay testing accompanying. Five hours in course in Ceramics and four hours in course in Clay Working.

703. Ceramic Chemistry. Course 501 continued. Rational analysis of clays and pottery bodies, chemical calculations. Five hours' credit. Two recitations and three laboratories per week.

704. Ceramics. Manufacture of clay wares, including preparation of the clay, formation of the ware, drying and burning. Five lectures per week.

705. Ceramics. Visits to important clay and cement working centers. Careful study and written reports on the plants inspected. One hour credit.

806. Ceramics. Manufacture and technique of glazes, enamels, cements, and cement products. Five hours' credit. Three recitations and two laboratories per week.

807. Ceramics. Quantitative analysis and compounding of bodies, glazes and cements. Special problems, some one of which shall be the basis for a thesis. Five hours' credit. Two recitations and three laboratory periods per week.

INDUSTRIAL CHEMISTRY.

The attention of students pursuing any of the engineering courses or wishing to enter the Engineering Division and desiring to take work in industrial chemistry is called to the facilities offered for such work at Ames.

The courses in Mining Engineering and Ceramics, especially in Ceramics and Clayworking, have made it necessary to place on the Engineering Faculty a thoroughly competent and experienced industrial chemist. The equipment necessarily provided in connection with the course in Ceramics and Clayworking gives the Division of Engineering the best facilities for work in industrial chemistry. For the detailed description of the courses in industrial chemistry see department of chemistry. Students desiring to pursue such work can arrange a course in consultation with the Dean of Engineering and the head of the Department of Chemistry, and on completion of four years' work equal in number of credit hours and quality to that required in other engineering courses, will receive the degree of B. S. in Industrial Chemistry.

SUMMARY ENGINEERING COURSES.

Mechanical Engineering Courses.

Note.—(The numbers after the hyphens indicate additional courses required of students taking the Five Year Course.)

	Four Year Course	Five Year Course
Chemistry 41 (3), 42 (3), 43 (3), 45 (2).	11	
2 (5), 5 (5).		10
Civil Engineering 345 (2), 446 (2), 721 (3), 855 (2).	0	9
Economic Science 9 (3),—15 (3).	3	6
Electrical Engineering 610 (3), 717 (1), 815 (3), 818 (1).	8	
610 (3), 720 (2), 815 (3), 818 (1).		9
Engineering 603 (1), 702 (1), 801 (1).	3	3
English 10 (3), 11 (3), 12 (2).	8	8
History 17 (1), 18 (1),—4 (3), 6 (3).	2	8
Mathematics 20 (4), 21 (1), 22 (2), 23 (3), 24 (2), 25 (3), 26 (4).	19	19
Mechanical Engineering 117 (R), 121 (2), 130 (2), 218 (R), 220 (2), 232 (2), 322 (1), 331 (2), 401 (3), 423 (2), 437 (1), 439 (1), 502 (5), 503 (3), 512 (1), 524 (1), 533 (2), 541 (2), 605 (3), 606 (5), 613 (1), 625 (1), 634 (2), 642 (1), 704 (3), 707 (2), 708 (3), 714 (1), 726 (2), 735 (2), 743 (R), 819 (3), 811 (4), 827 (3), 844 (R),—815(1).	68	69
Military 1, 2, 3 or Athletics, 4 or Athletics	R	R
Modern Languages (3), (3), or Literature (3), (3).	6	6
Physics 303 (5), 404 (5), 506 (3), 523 (1), 615 (1),—801 (3).	15	18
Physics 801 (3), or Civil Engineering 855 (2), and Mechanical Engineering 815 (1).	3	
Electives (2), (4), (2), (2), (5).		15
Totals	146	180

Civil Engineering Courses.

Note.—(The numbers after the hyphens indicate additional courses required of students taking the Five Year Course.)

	Four Year Course	Five Year Course
Chemistry 41 (3), 49 (4).	7	
2 (5), 5 (5).		10
Civil Engineering 101 (1), 102 (2), 141 (R), 203 (1), 204 (2), 231 (R), 242 (R), 305 (1), 308 (4), 343 (R), 349 (1), 407 (1), 409 (4), 432 (R), 444 (R), 450 (1), 510 (5), 514 (1), 524 (2½), 527 (R), 611 (4), 615 (1), 617 (4), 628 (R), 633 (R), 653 (2), 712 (2), 716 (1), 718 (2),		

720 (2), 721 (3), 723 (2), 725 (R), 729 (R), 819 (5), 822 (3), 826 (3), 830 (R).	60½	
For Five Year Course add 206 (1).		61½
Civil Engineering 738 (3), 839 (3).		
Civil Engineering 754 (1), 834 (3). Mechanical Engineering 788 (2).	6	
Civil Engineering 735 (3), 836 (3).		
Economics Science 14 (2),—9 (3), 15 (3).	2	6
Electrical Engineering 503 (2).	2	2
Engineering 702 (1), 801 (1), 603 (1).	3	3
English 10 (3), 11 (3), 12 (2),—13 (2).	8	10
Geology 803 (3), or Physics 801 (3).	3	3
History 17 (1), 18 (1),—6 (3), 4 (3).	2	6
Mathematics 20 (4), 21 (1), 22 (2), 23 (3), 24 (2), 25 (3), 26 (4), 27 (1½).	20½	20½
Mechanical Engineering 181 (1), 401 (3), 502 (5), 686 (4), 784 (2).	15	15
Military 1, 2, 3 or Athletics, 4 or Athletics	R	R
Modern Languages (3), (3), or Literature (3), (3).	6	6
Physics 303 (5), 404 (5), 523 (1).	11	11
Electives (2), (3), (4), (5), (4), (2), (3), (3).		26
Totals	146	180

Electrical Engineering Courses.

Note.—(The numbers after the hyphens indicate additional courses required of students taking the Five Year Course.)

	Four Year Course	Five Year Course
Chemistry 41 (3), 42 (3), 43 (3), 45 (2).	11	
Chemistry 2 (5), 5 (5).		10
Civics 6 (3).		3
Civil Engineering 751 (3).	3	
Civil Engineering 345 (2), 446 (2).		4
Economic Science 9 (3),—12 (3).	3	6
Electrical Engineering 101 (R), 202 (R), 604 (4), 619 (1), 711 (5), 720 (2), 724 (2), 729 (R), 809 (3), 816 (3), 821 (2), 825 (2), 830 (R), 840 (4).	28	28
Engineering 603 (1), 702 (1), 801 (1).	3	3
English 10 (3), 11 (3), 12 (2),—13 (2).	8	10
Geology 501 (4).		4
History 17 (1), 18 (1),—4 (3), 6 (3).	2	8
Literature 13 (2), 14 (2).		4
Mathematics 10 (2), 20 (4), 21 (1), 22 (2), 23 (3), 24 (2), 25 (3), 26 (4).	21	21
Mechanical Engineering 121 (2), 130 (2), 220 (2), 232 (2),		

322 (1), 331 (2), 401 (3), 423 (2), 437 (1), 439 (1), 502 (5), 503 (3), 512 (1), 533 (2), 613 (1), 686 (4), 685 (2), 784 (2), 809 (3).	41	
For the Five Year Course add 634 (2), 605 (2), 606 (4), and omit 686 (4), 689 (2), 809 (3).		40
Military 1, 2, 3 or Athletics, 4 or Athletics	R	R
Modern Languages (3), (3), or Literature (3), (3).	6	6
Physics 303 (5), 404 (5), 506 (3), 514 (2), 607 (3), 617 (2).	20	20
Electives (2), (2), (4), (2), (3).		13
Totals	146	180

Mining Engineering Courses.

Note.—(The numbers after the hyphens indicate additional courses required of students taking the Five Year Course.)

	Four Year Course	Five Year Course
Chemistry 41 (3), 42 (3), 43 (3), 46 (4).	13	
Chemistry 2 (5), 5 (5), 50 (5).		15
Civil Engineering 345 (2), 446 (2), 656 (3).	7	
Civil Engineering 308 (4), 409 (4), 611 (4), 822 (3), 615 (1).		16
Economic Science 9 (3), 15 (3).		6
Electrical Engineering 712 (3).	3	3
Engineering 603 (1), 702 (1), 801 (1).	3	3
English 10 (3), 11 (3), 12 (2),—13 (2).	8	10
Geology 501 (4), 607 (4), 704 (4), 805 (4),—2 (3).	16	19
History 6 (3), 4 (3).		6
History 17 (1), 18 (1).	2	
Mathematics 20 (4), 21 (1), 22 (2), 23 (3), 24 (2), 25 (3), 26 (4).	19	19
Mechanical Engineering 121 (2), 130 (2), 231 (2), 220 (2), 322 (1), 401 (3), 483 (1), 502 (5), 512 (1), 686 (4), 784 (2), 809 (3).	28	
For Five Year Course add 423 (2), and omit 512 (1), 809 (3).		26
Military 1, 2, 3 or Athletics, 4 or Athletics	R	R
Mining Engineering 101 (R), 220 (R), 212 (R), 318 (R), 419 (R), 510 (4), 506 (R), 530 (4), 602 (3), 614 (3), 607 (R), 613 (R), 715 (5), 703 (3), 708 (R), 804 (5), 809 (R).	27	
For Five Year Course add 618 (3), 919 (R), 817 (5), 1020 (R), and omit 804 (5).		26
Modern Languages (3), (3), or Literature (3), (3).	6	6
Physics 303 (5), 404 (5),—523 (1).	10	11

Thesis: Mining Engineering 816 (5). Mining Engineering 817 (5). Geology 808 (5).	5	
Electives (1), (1), (5), (3), (4).		14
Totals	147	180

Ceramics Course.

Ceramics 501 (5), 602 (5), 703 (5), 704 (5), 705 (1), 806 (5), 807 (5).	31
Chemistry 41 (3), 42 (3), 43 (3), 46 (4).	13
Civil Engineering 345 (2), 446 (2), 656 (3).	7
Engineering 603 (1), 702 (1), 801 (1).	3
English 10 (3), 11 (3), 12 (2).	8
Geology 501 (5), 704 (4), 805 (4).	13
History 17 (1), 18 (1).	2
Mathematics 20 (4), 21 (1), 22 (2), 23 (3), 24 (2), 25 (3), 26 (4).	19
Mechanical Engineering 121 (2), 130 (2), 220 (2), 331 (2), 322 (1), 401 (3), 483 (1), 502 (5), 503 (3), 613 (1), 686 (4), 784 (2), 809, (3).	31
Military 1, 2, 3 or Athletics, 4 or Athletics	R
Mining Engineering 101 (R), 220 (R), 212 (R), 318 (R), 419 (R), 423 (R), 506 (R), 607 (R), 613 (R), 614 (3), 708 (R), 809 (R).	3
Modern Languages (3), (3), or Literature (3), (3).	6
Physics 303 (5), 404 (5), 523 (1).	11
Total	147

Engineering Experiment Station

Engineering Experiment Station

ANSON MARSTON, DIRECTOR.

While the principal business of the several Engineering departments of the College is perhaps to give instruction to their students, the fact is recognized that the state contributes largely to the financial support of the College and that in return, not only should the College give tuition to the youth of Iowa, but it should contribute as much as possible to the successful carrying on of the industrial interests of the state. By the establishment of experiment stations the national government has recognized the duty of the land grant colleges to the agricultural interests. The Engineering departments of this College believe that it is their proper business to aid the other industrial enterprises of the state.

With this thought as the motive, the several Engineering departments have undertaken during the past years and will continue in the future to undertake to carry on investigations of interest and value to the industries of Iowa, as need therefor may arise, in so far as the funds available will permit. A number of pamphlets and bulletins giving the results of some of these investigations have been published, and have been received with much favor by the people of the state. By strong resolutions numerous industrial and public organizations in Iowa have expressed their approval of this work.

In recognition and furtherance of this work the Thirty-first General Assembly appropriated a specific annual sum for the establishment of an Engineering Experiment Station, for carrying on and publishing bulletins of investigations of value to the industrial and municipal interests of Iowa. In further recognition of the work, this appropriation was increased by the Thirty-third General Assembly. The work of the Engineering Experiment Station has been having a steady growth, and while the total appropriation available remains too small to meet the necessities of the important work undertaken, yet it seems certain to receive increased support from the State in the near future.

One of the most important lines of investigation already undertaken is sewage disposal. The first sewage disposal plant in Iowa was constructed at the College in 1898 and has been in highly successful operation ever since. The authorities of many cities in the state have visited it. The College is continually carrying on investigations in sewage disposal, both with the large plant and with smaller experimental plants. Among the special subjects now being investigated may be mentioned those of the disposal of creamery sewage, and small plants, built for less than $150 each, for disposing of the sewage of private houses. In addition a representative of the Engineering Experiment Station each year visits as many as possible of the sewage disposal plants of the state, making tests of the efficiency and securing the data of the operation of the plants. The results of these examinations and of other investigations are published in bulletin form for free distribution.

Another line of investigation has been tests of building materials, which have also been under way for several years. Thousands of such tests, of all kinds of building materials in Iowa, have been made and the results published for the benefit both of the manufacturers and the consumers of the state. Tests of cement are of especial importance, and the calls upon the station to conduct such tests are continually increasing. Cities, county officers, engineers, cement tile and block manufacturers, cement dealers and others using cement are invited to send samples of not less than ten pounds each, addressed to A. Marston, Director, Ames, Iowa. Upon such samples, the standard tests prescribed by the American Society for Testing Materials will be made and reports sent for a very small cost. Only in this way can cement users be certain that their material is up to grade. Another important line of testing which has been growing in importance in the work of the station is that of brick testing. Cities which wish to have paving brick testing done should send not less than thirty brick, addressed to A. Marston, Director, Ames, Iowa. In the case of building brick, ten brick will be sufficient for testing. Care should be taken in selecting the samples to get a fair average of the brick, as tests of brick show much variation in the results on different specimens in the same pile.

Investigations helpful to the clay interests of the state have been under way for some years, and additional equipment is being put in for this work. Opportunity is provided whereby anyone can send to the Experiment Station samples of clay, to be tested as to suitability for material for brick, tile or other clay wares. Special investigation is now under way with fire brick clays of the state and the possibility of developing thereby a new line of clay manufacture in Iowa.

During past years the Mining Engineering Section of the Station has been engaged in careful investigation of cement materials of the state. A very large number of samples of materials have been sent in from different parts of the state and have been carefully analyzed and studied as to their availability as cement materials. This work has been done in co-operation with the State Geological Survey.

An investigation of the properties of Iowa limes as compared with those from other states has been completed, and a bulletin of the results published.

The investigations of Iowa coals have been of much value to the manufacturers and to the mining interests of the state, as has been shown by the large demand for the bulletin already published. This work is being continued and largely extended.

Careful tests of electric lamps have been made a special feature of the Engineering Experiment Station work. Any city or corporation can now send its lamps to the station (which has been made the official testing station of the Iowa Electrical Association) and have careful tests of efficiency, candle power and durability made at short notice and slight cost, and thus determine whether it is getting proper return for the money paid for its lamps. Many such lamps are being sent in, and in addition special investigations along this line are being conducted, the results of which will be published in bulletin form.

It is planned to conduct a statistical inquiry of the power plants of the state, with personal examination of each plant and study its conditions. The results of this investigation will be helpful in suggesting improvements in methods and systems in Iowa power plants.

An investigation is already being started of electric lighting and power plants suitable for installation on farms. In a few cases in Iowa, hydraulic power is available for the operation of such plants, while in many cases they can be operated from gasoline engines such as are coming into common use on Iowa farms. Another electrical investigation which is under way is that of the relative merits of different kinds of grounding materials for secondary electrical circuits. This investigation was undertaken at the request of the Iowa Electrical Association, and it is expected to have results ready to publish by April, 1910.

During the past two years special attention has been given to investigation along the line of drainage engineering. Up to the present time data has not existed by which drainage engineers could compute the sizes of ditches and drains required under different conditions in this state, and, undoubtedly, very large sums of money are being wasted on account of mistakes in drainage engineering. For two years we have been making gaugings ef the actual flow of water in tile drainage systems and have secured important results during the past year which are to be published immediately in bulletin form. In addition, the Engineering Experiment Station has been engaged in making very extensive investigations of the merits and defects of cement drain tile as compared with clay drain tile and has accumulated a large mass of data on the subject. A bulletin on this subject is to be published in the immediate future.

In co-operation with the Iowa Highway Commission, a very important series of investigations on the quality of Iowa road making materials has been under way during the year 1909.

The above is only a part of the work done or planned by the Engineering Experiment Station.

TESTS OF MATERIALS.

More and more, the cities and other public bodies of the state, together with private corporations, are sending in samples of various materials to be tested in the laboratories of the Engineering Experiment Station.

Many places are having their cements tested to see whether they are up to specifications.

The same is true of brick, both for paving and building purposes.

Steel, iron, stone, wood, and other materials of construction can be sent in for tests to advantage.

Users of cement are sending samples of their sands for tests, to select the best.

Many samples of clay are received for analysis, test, and report as to value.

Many samples of cement and clay drain tile and sewer pipe are submitted for tests.

Ores are received for assaying work.

Coal can be sent in for test of its calorific value for fuel and the absence of deleterious elements.

Electric lamps are being sent in by many cities and corporations for test to decide whether they are up to the representations on which they were bought.

All such testing work for the people of Iowa is done at bare cost. We invite further work of this kind, and promise our best efforts to be of assistance to all residents of the state along these and similar lines.

LIST OF ENGINEERING EXPERIMENT STATION BULLETINS.

The engineering Experiment Station has issued the following bulletins:

The Iowa State College Sewage Disposal Plant and Investigations. (Out of print.)

Bacteriological Investigations of the Iowa State College Sewage. (Out of print.)

Data of Iowa Sewage and Sewage Disposal.

Bacteriological Investigations of the Iowa State College Sewage Disposal Plant. (Out of print.)

Chemical Composition of the Sewage in the Iowa State College Sewage Disposal Plant. (Out of print.)

Tests of Iowa Common Brick. (Out of print.)

Sewage Disposal in Iowa. (Out of print.)

Results of Tests of Varieties of Dry Press Brick Commonly Used in Iowa.

Notes on Steam Generation With Iowa Coal. (Out of print.)

Dredging by the Hydraulic Method. (Out of print.)

An investigation of Some Iowa Sewage Disposal Systems. (Out of print.)

The Good Roads Problem in Iowa. (Out of print.)

Tests of Cement.

State Railroad Taxation.

Steam Generation With Iowa Coals.

Incandescent Lamp Testing.

Steam Pipe Covering Tests.

Assessments of Drainage Districts. (Out of print.)

Tests of Iowa Limes.

The Holding Power of Nails.

The Effects of Coloring and Waterproofing on the Strength and Permeability of Cement Blocks. The Improvement of Cement Mortar by Grading the Size of the Sand. Tests of the Impermeability of Reinforced Concrete Pipes.

An Investigation of the Proper Proportion for Mortar and Concrete; An Investigation of the Effect of Clay and Reground Cement on the Permeability of Concrete and Cement Mortars; An Investigation of Patent Compounds for Waterproofing Concrete.

Sewage Disposal Plants for Private Houses.

The Sanitary Examination of Well Water.

The Results of Some Drainage Investigations in Iowa.

Any of the above bulletins of which the supply is not exhausted can be obtained by writing to A. Marston, Director, Ames, Iowa.

IOWA STATE HIGHWAY COMMISSION.

ANSON MARSTON, DIRECTOR.
CHARLES FRANKLIN CURTISS, DIRECTOR.
THOMAS HARRIS MAC DONALD, HIGHWAY ENGINEER.
JAY BROWNLEE DAVIDSON, ENGINEER, ROAD MACHINERY.
JOHN EDWARD KIRKHAM, CONSULTING BRIDGE ENGINEER.
C. S. NICHOLS, ASSISTANT HIGHWAY ENGINEER.

Establishment of the Commission.

Chapter 105, Acts of the Thirtieth General Assembly, passed in 1904, constituted the College, as an institution, the Highway Commission for the State and outlined the duties in a general way as follows: To plan and devise new methods and systems of road construction and maintenance, to hold schools of instruction for road officers, to send out information of all kinds to supervisors and others who make request, to furnish trained operators of machinery and superintendents of construction for public demonstrations of highway improvement.

The administration of the affairs of the Highway Commission was placed under the joint direction of the Divisions of Engineering and Agriculture, on account of the nature of the work being so closely related to each.

Since the work was entered upon the opportunities for taking up all the different phases of road construction and maintenance have been increasing very rapidly, and during the five years of its existence the Commission has established itself in certain lines of work taken up throughout the state.

Work of the Commission.

Road Work. On request of county supervisors and other road officers the Commission has aided a number of communities to start building better roads by providing them trained operators of road machinery or road engineers who superintend their construction work. Stretches of road varying in length from one-half to three miles long, and of different types, have been built in Story, Pottawattamie, Black Hawk, Palo Alto, Sioux, and Poweshiek counties. Surveys, estimates of cost, and information as to the best methods to employ in road building have been furnished to a large number of other counties.

Bridge and Culvert Work. The most active interest of the Commission so far has been in improving the culverts and bridges built both in regard to the actual type of construction of these structures and in regard to the methods of handling the public funds with which they are built. Hundreds of plans for concrete culverts of the smaller type have been prepared and distributed broadcast to road officers over the state, and has been one of the main factors in popularizing this form of construction so that there are perhaps no counties in the state where this form of construction has not been started to some extent. Most of the large bridges built during the past two years in he state, outside of incorporated towns, have been under plans and general supervision of the Commission, including two Des Moines river bridges, and an eighty-foot, reinforced concrete bridge, sixty-six feet wide, at Mason City. These plans and general supervision are supplied ree to the counties by the commission, but in the erection of the larger bridges the counties are required to keep inspectors on the work who eport direct to the commission.

Bulletins Published. From time to time bulletins are published nd distributed of which the following is the list to date:

Manual for Highway Road Officers, 104 p., 3,000 copies.
1905 Proceedings, Iowa Good Roads Association, 64 p., 2,000 copies.
1906 Proceedings, Iowa Good Roads Association, 54 p., 2,000 copies.
(Paid for by Iowa Good Roads Association.)
The Good Roads Problem in Iowa, 24 p., 15,000 copies.
Announcement of 1905 Road School, 15,000 copies.
1906 Revision of Manual, 148 p., 3,000 copies.
First Annual Report, 74 p., 10,000 copies.
Second Annual Report, 40 p., 10,000 copies.
Announcement of 1907 Road School, 8 p., 15,000 copies.
Road and Bridge Improvement for 1908, 16 p., 10,000 copies.
Report for the Years 1907-1908, 42 p., 10,000 copies.

The editions of practically all these bulletins have been exhausted except the last two reports, which may be obtained by writing to the Commission. Other bulletins will be published as fast as the funds permit.

Institutes and Short Course Work. Speakers are supplied by the Commission for the discussion of road subjects for Farmers' Institutes and some of the Short Courses are held at the various points, but the activity along this line is not confined to these particular meetings, as most of the organizations of a semi-public nature in the state include discussions of road or bridge matters at their regular meetings.

Tests of Road Materials. Many tests of materials for use in road surfacing or in bridge building have been made by the commission, the most important of these being the tests of road material carried on during the past year in connection with the State Geological Survey and the Engineering Experiment Station of the College. Samples of all the stone and gravel in the state have been gathered, analyzed, and tested for road surfacing material, and it is planned to carry the tests further to determine their value for concrete purposes.

The Aim of the Highway Commission is to build up an engineering and advisory bureau to furnish practical aid to the counties and at the same time to carry on experiments and demonstrations of educational and scientific value. The methods of road and bridge work of the state are in serious need of a radical revision, the most important single requirement, perhaps, being the employment of trained men for the carrying on of this work. Such a revision is absolutely sure to come and there will then be required a large number of young men who have fitted themselves for this class of work. Highway Engineering as a profession will offer many opportunities throughout the Middle West states within the next few years.

Division of Science as Related to the Industries

Division of Science as Related to the Industries

ALBERT BOYNTON STORMS, DEAN.

Many of the courses of study taught in this Division form a very essential part of those belonging to the other Divisions, so that the work required for the various degrees conferred by the College authorities is very thoroughly interwoven.

The object of the work in this Division is very comprehensively expressed in the act of Congress establishing this and similar colleges. The founding of these colleges on a basis of scientific learning has proved to be the beginning of an important epoch in educational history. The courses of study in this Division are less technical than are many of those of the other Divisions. The real advances in modern civilization have been along the lines of science study and investigations. It is the intent, therefore, to lay a broad foundation in scientific facts and principles in order to fit the graduate to fill his place in the affairs of the world. There can be no better preparation for the duties of life and for citizenship than the knowledge and mental training given by a genuine study of the sciences.

During the first two years the lines of study are well marked out and but little choice of subjects is given. The required mathematics end with the Freshman year. The subject may be pursued, however, during the remainder of the course, provided the student desires and is qualified to do so.

The various branches of the study of the English language extending throughout the Freshman and Sophomore years are sufficient in scope and purpose to give the needed training in the use of English. The modern languages, namely, French, German and Spanish, are great storehouses of the sciences, and consequently courses of study in these languages are offered to the student in the earlier years of his work to enable him to use these languages in the last two years of his study. The study of the sciences is strongly supported by work in literary, historical and psychological lines.

The course in General Science leads to the degree of Bachelor of Science (B. S.).

The course in Domestic Economy leads to the degree of Bachelor of Science in Domestic Economy (B. S. in D. E.).

COURSE IN GENERAL SCIENCE.

**Freshman Year.

FIRST SEMESTER.

Required semester hours

Science:

Students who take Botany or Zoology in the Freshman year will be required to take Chemistry 2, or Physics 301 or 303, in the Sophomore year. Students who take Chemistry in the Freshman year will be required to take Botany 27, or Zoology 2, in the Sophomore year.

The science chosen must be continued through the entire Freshman year.

				Required semester hours
Choice	Botany 27,	General Botany	5	5
	Chemistry 2,	General Chemistry	5	
	Zoology 2,	General Zoology	5	
	Mathematics 4,	College Algebra		5
	English 10,	Narration and Description		3

Modern Languages:

The Language selected must be carried through the entire year.

				Required semester hours
Choice	Language 3,	French	3	3
	Language 7,	German	3	

Elective to be selected from the list of Junior College Electives 2

Fully accredited students who have presented for admission four credits in Latin will take Modern Language 1, 5 or 30, instead of Modern Language, three hours, and Elective, two hours.

Military 1 (for men),	Military Drill
Physical Culture 1 (for women),	Marching Tactics
Domestic Economy 41 (for women),	Personal Sanitation and Hygiene
Library 1,	Library work (four hours per semester)

Total semester hours 18

**Freshmen who show deficient preparation in English or Mathematics may be assigned by the Dean of the Junior College and the Dean of Science, to special classes, with one hour more work than indicated above, and in case of clear indication of failure in either of these subjects, even with this arrangement, they will be dropped from the freshman work in this line until they have given proof of sufficient preparation to enable them to carry the work successfully.

SECOND SEMESTER.

Required semester hours

Science:

The science selected must be a continuation of the one chosen at the beginning of the Freshman year.

	Course	Subject		Required semester hours
Choice	Botany 28,	General Botany	5	5
	Chemistry 5,	Qualitative Analysis	5	
	Zoology 3,	General Zoology	5	
	Mathematics 6,	Solid Geometry		2
	Mathematics 30,	Plane Trigonometry		3
	English 11,	Exposition		3

Modern Languages:

The Language selected must be a continuation of the one chosen at the beginning of the Freshman year.

	Course	Subject		Required semester hours
Choice	Language 4,	French	3	3
	Language 8,	German	3	

Those who took Language 1, 5, or 30 in the first semester Freshman will continue with Language 58, 6a or 34.

Course	Subject	Required semester hours
History 5,	Europe in XVIth, XVIIth, and XVIIIth Centuries	3
Military 2 (for men),	Military Drill	
Physical Culture 2 (for women),	Calisthenics	
	Total semester hours	19

Sophomore Year.

THIRD SEMESTER.

Required semester hours

Course		Subject		Required semester hours	
English 12,		Argumentation		2	2
*Bacteriology 1,		Bacteriology	4	16 to 18	
*Botany	27,	General Botany	5		
	4,	Cryptogamic Botany	5		
*Chemistry	2,	General Chemistry	5		
	11,	Quantitative Analysis	5		
*Mathematics 8,		Plane Analytical Geometry	5		
*Physics	301,	Mechanics and Heat	3		
	303,	Mechanics and Heat	5		
*Zoology	2,	General Zoology	5		
	5,	Embryology	5		
History 6,		French Revolution and XIXth Century	3		

Modern Languages:

The student may continue the Language taken in the Freshman year.

Language 51 or 53,	French	3	
Language 27 or 24,	German	3	
Those who took Language 58 or 6a in second semester Freshman will take Language 3, 7, 16, 18, or 20.			
Public Speaking 2,	The Declamation	1	
Domestic Economy 1 (for women),	Clothing	2	
Military 3, or Athletics (for men),			
Physical Culture 3 (for women),	Light Apparatus		
	Total semester hours		18 to 20

Rules for the selection of studies in this semester.

1. Students who take Botany or Zoology in the Freshman year will be required to take Chemistry 2, or Physics 301 or 303, in the Sophomore year. Students who take Chemistry in the Freshman year will be required to take Botany 27, or Zoology 2, in the Sophomore year.
2. Not less than 8 hours of the starred (*) subjects must be selected.
3. Not more than 5 hours can be taken in any department.
4. Any beginning science chosen must be carried through the year.

FOURTH SEMESTER.

Any beginning science of first semester Sophomore year, must be continued through this semester.

			Required semester hours	
*Botany	28,	General Botany	5	
	12,	Vegetable Cytology	5	
	15,	Systematic Phanerogams	5	
*Chemistry	5,	Qualitative Analysis	5	
	9,	Organic Chemistry	5	
*Mathematics 9,		Differential and Integral Calculus	5	
*Physics	402,	Electricity and Magnetism and Light and Sound	3	
	404,	Electricity and Magnetism and Light and Sound	5	
*Zoology	3,	General Zoology	5	
	7	Comparative Anatomy	5	18 to 20
	14,	Advanced Invertebrate Zoology	3	
Economic Science 16,		Actual Government	3	
Literature 2,		Epic and Lyric Poetry	5	

The student may continue the Language taken in the first semester Sophomore.

Modern Languages:

Language 52 or 54,	French	3
Language 28 or 25,	German	3

Those who took Language 3, 7, 16, 18, or 20 in the first semester Sophomore will take Language 4, 8, 17, 19, or 21.

Domestic Economy 4, (for women),	Clothing	2
Military 4, or Athletics (for men)		
Physical Culture 4, (for women),	Swedish Gymnastics	
	Total semester hours	18 to 20

Junior Year.

Either at the beginning of the Junior year or not later than the end of the first semester of that year candidates for the degree of Bachelor of Science in the General Science course must select a science which shall constitute a major line of study throughout the Junior and Senior years. This work shall occupy not less than three hours per week during any one semester. The total number of hours of the major subject, however, shall be not less than sixteen hours during the two years. In addition to the work in the chosen line of study, or the major subject, the student will be required to choose at the same time from ten to fifteen hours of courses that are requisite to the proper development of this work to constitute the major line of study for the two years. The major with the additional study requisite to it are to be decided upon after consultation with the Dean of Science and the Head of the Department in which the major is taken. The major science shall be chosen from among the following named sciences: Bacteriology, Botany, Zoology, Physics, Economic Science, Mathematics, Geology and Chemistry. The remainder of the total sixty-four to eighty hours required shall be selected from the list of electives on page 270 on consultation with the Dean of Science. A classification of at least sixteen hours is required each semester. The outlined course for the two years as placed on file in the Dean's office cannot be changed without the special permission of the Dean.

FIFTH SEMESTER.

(Elective)	Required semester hours
Enough work will be selected from the list of Senior College Electives given on page 270 to make a total of from sixteen to twenty hours per week.	16 to 20
Total	16 to 20

SIXTH SEMESTER.

		Required semester hours
Public Speaking 8,	Orations and Orators	1
Elective:		

Enough work will be selected from the list of Senior

College Electives given on page 270 to make a total of from sixteen to twenty hours per week.	15 to 19
Total	16 to 20

Senior Year.

SEVENTH SEMESTER.

(Required)		Required semester hours
Choice {Public Speaking 10,	Extempore Speech 2	1 or 2
Choice {Public Speaking 9,	Oration 1	
Elective:		
Enough work will be selected from the list of Senior College Electives given on page 270 to make a total of from sixteen to twenty hours per week.		15 to 18
	Total	16 to 20

EIGHTH SEMESTER.

		Required semester hours
Elective:		
From sixteen to twenty hours per week will be selected from the list of Senior College Electives given on page 270.		
	Total	16 to 20

COURSE IN DOMESTIC ECONOMY.

(For Women Only.)

Freshman Year.

FIRST SEMESTER.

		Required Semester hours
Domestic Economy 1,	Clothing	2
Mathematics 4,	College Algebra	5
Botany 29,	General Botany	5
English 10,	Narration and Description	3
Physical Culture 1,	Marching Tactics	
Domestic Economy 41,	Personal Sanitation and Hygiene	
Elective:		
To be selected from the Junior College Electives on page 269		3 or 5
	Total hours required	18 to 20

SECOND SEMESTER.

		Required semester hours
Domestic Economy 4,	Clothing	2
Mathematics 6,	Solid Geometry	2
Mathematics 30,	Plane Trigonometry	3
Chemistry 22,	Elementary Chemistry	5
English 11,	Exposition	3
Physical Culture 2,	Calisthenics	
Elective:		
To be selected from the Junior College Electives on page 269		3 or 5
	Total hours required	18 to 20

Sophomore Year.

THIRD SEMESTER.

		Required semester hours
Domestic Economy 6,	Costume	2
Chemistry 24,	Elementary Applied Chemistry	5
Physics 301,	Mechanics and Heat	3
Zoology 2,	General Zoology	5
Physical Culture 3,	Light Apparatus	
Elective:		
To be selected from the Junior College Electives on page 269		3 or 5
	Total hours required	18 to 20

FOURTH SEMESTER.

		Required semester hours
Domestic Economy 7,	Costume	2
Chemistry 9,	Organic Chemistry	5
Physics 402,	Electricity and Magnetism and Light and Sound	3
Zoology 3,	General Zoology	5
Physical Culture 4,	Swedish Gymnastics	
Elective:		
To be selected from the Junior College Electives on page 269		3 or 5
	Total hours required	18 to 20

Junior Year.

FIFTH SEMESTER.

		Required Semester hours
Chemistry 11,	Quantitative Analysis	5
Zoology 12,	Human Physiology	5
Bacteriology 2,	General Bacteriology	2
Enough work will be selected from the list of Senior College Electives on page 270 to make		4 or 8
	Total hours required	16 to 20

SIXTH SEMESTER.

		Required Semester hours
Horticulture 11,	Floriculture	2
Zoology 13,	Human Physiology	5
Domestic Economy 35,	Food and Dietetics	5
Domestic Economy 37,	Home Sanitation	2
Bacteriology 3,	Fermentations	2
Enough work will be selected from the list of Senior College Electives on page 270 to make		0 or 4
	Total hours required	16 to 20

Senior Year.

SEVENTH SEMESTER.

			Required Semester hours
Domestic Economy 8,	Laundry Work		1
Domestic Economy 27,	Household Accounts		1
Domestic Economy 36,	Food and Dietetics		5
Public Speaking 15,	D. E. Extempore Speech		2
Elective:			
Domestic Economy 9,	Theory of Teaching Domestic Science	2	7 to 11
Domestic Economy 11,	History of Art	2	
Domestic Economy 14,	Theory of Teaching Domestic Art	2	
For additional Electives, see page 270.			
	Total hours required		16 to 20

EIGHTH SEMESTER.

		Required Semester hours
Domestic Economy 13,	Home Decoration	1

Domestic Economy 22,	Home Nursing		1
Domestic Economy 23,	Home Management		1
Domestic Economy 38,	Geography of Foods		2
Elective:			
Domestic Economy 10,	Theory and Practice of Teaching Domestic Science	2	11 to 15
Domestic Economy 12,	History of Art	2	
Domestic Economy 30,	Seminar	1	
Domestic Economy 32,	Theory and Practice of Teaching Domestic Art	2	

For Additional Electives, see page 270.

Total hours required	16 to 20

SUMMARY SCIENCE DIVISION.

NOTE.—The number before the parenthesis indicates the course number. The number in the parenthesis indicates the number of hours' credit.

GENERAL SCIENCE COURSE.

	Credit hours
Domestic Economy 41	R
English 10 (3), 11 (3), 12 (2)	8
History 5 (3)	3
Library 1	R
Mathematics 4 (5), 6 (2), 30 (3)	10
Military 1, 2, 3 or Athletics, 4 or Athletics (for men) Physical Culture 1, 2, 3, 4 (for women)	R
Modern Language (5), (3), or Modern Language (3), (3) and Elective (2)	8
Public Speaking 8 (1), 9 (1)	2
Junior College Electives:	
See list and rules under each semester of General Science Course. 1st semester (5), 2d semester (5), 3d semester (16), 4th semester (18)	44
Senior College Electives:	
Major (16)	16
Selected from list of Science Electives	46
Grand Total	137

DOMESTIC ECONOMY COURSE.

	Credit hours
Bacteriology 2 (2), 3 (2)	4
Botany 29 (5)	5

Chemistry 9 (5), 11 (5), 22 (5), 24 (5)	20
Domestic Economy 1 (2), 4 (2), 6 (2), 7 (2), 8 (1), 13 (1), 22 (1), 23 (1), 27 (1), 35 (5), 36 (5), 37 (2), 38 (2), 41	27
English 10 (3), 11 (3)	6
Horticulture 11 (2)	2
Mathematics 4 (5), 6 (2), 30 (3)	10
Physical Culture 1, 2, 3, 4	R
Physics 301 (3), 402 (3)	6
Public Speaking 15 (2)	2
Zoology 2 (5), 3 (5), 12 (5), 13 (5)	20
Junior College Electives (3), (3), (3), (3) See following list.	12
Senior College Electives (2), (2), (7), (11) See outlined course which allows Domestic Economy 9 (2), 10 (2), 11 (2), 12 (2), 14 (2), 30 (1), 32 (2), or any Senior College General Science Elective.	22
Grand Total	136

ELECTIVES SCIENCE DIVISION.

Junior College Electives.

Subjects which may be elected in the Freshman and Sophomore years in the Domestic Economy Course and which are called Junior College electives.

(The number in the parenthesis indicates the number of hours' credit.)

Botany 4 (5), 12 (4), 15 (3 or 5), 28 (5).
Civics 6 (2), 9 (3).
Civil Engineering 308 (4).
Domestic Economy 39, 40.
Economic Science 9 (3).
English 12 (2).
History 5 (3), 6 (3).
Languages 1 (5), 2 (5), 3 (3), 4 (3), 5 (5), 5a (3), 6 (5), 6a (3), 7 (3), 8 (3), 16 (3), 17 (3), 18 (3), 19 (3), 20 (3), 21 (3), 24 (3), 25 (3), 27 (3), 28 (3), 30 (5), 31 (5), 32 (5), 36 (3), 40 (2), 41 (2), 51 (3), 53 (3).
Literature 1 (3), 2 (5), 5 (5).
Mathematics 8 (5), 9 (5), 23 (3), 24 (2), 25 (3), 26 (4).
Psychology 7 (3), 8 (3).
Public Speaking 2 (1).
Zoology 5 (3 or 5), 7 (5), 14 (3), 17 (3).

Senior College Electives.

NOTE—(The number in the parenthesis indicates the number of hours' credit.)

FIRST SEMESTER.

Subjects which count as Science:

Bacteriology 1 (4).

Botany 5 (3 or 5), 6 (3), 10 (2), 13 (2), 14 (2), 17 (3), 18 (1), 19 (2), 23 (1 to 5), 24 (1), 27 (5), 60 (2).

Chemistry 2 (5), 11 (5), 14 (5), 18 (2), 32 (4), 54 (4), 55 (4).

Domestic Economy 8 (1), 36 (5).

Economic Science 1 (5), 3 (3), 7 (2), 9 (3), 17 (2), 19 (2), 22 (3).

Geology 501 (4), 704 (4).

Mathematics 7 (2), 8 (5), 11 (5), 15 (2), 24 (2), 25 (3).

Physics 509 (2), 514 (2), 516 (2), 523 (1).

Zoology 2 (5), 4 (4), 5 (3 to 5), 10 (3 to 5), 11 (3 to 5), 12 (5), 18 (2).

General Subjects:

Agricultural Engineering 13 (2).

Civics 12 (2).

Civil Engineering 308 (4).

Domestic Economy 1 (2), 6 (2), 9 (2), 11 (2), 37 (2), 39.

English 12 (2), 13 (2).

History 3 (3), 5 (3), 6 (3), 10 (2), 12 (2), 20 (2).

Horticulture 8 (2).

Language 1 (5), 3 (5), 5 (5), 5a (3), 7 (5), 16 (3), 18 (3), 20 (3), 22 (2), 24 (3), 27 (3), 30 (5), 33 (3), 36 (3), 40 (2), 42 (2), 51 (3), 53 (3), 57 (3).

Literature 1 (3), 4 (3), 5 (5), 6 (2), 8 (2).

Military 5 (1), 7 (1).

Psychology 3 (3), 4 (3), 5 (3), 6 (3), 7 (3), 9 (2).

Public speaking 2 (1), 3 (2), 5 (2), 7 (2), 10 (2), 17 (1).

Veterinary 33 (2).

SECOND SEMESTER.

Subjects which count as Science:

Bacteriology 1 (4), 3 (2), 5 (4), 7 (3), 9 (3).

Botany 11 (4), 12 (4), 15 (3 or 5), 18 (1), 25 (2), 28 (5).

Chemistry 5 (5), 9 (5), 31 (4), 32 (4), 35 (4), 36 (5), 47 (5), 53 (4).

Domestic Economy 22 (1), 23 (1), 35 (5), 37 (2), 38 (2).

Dairy 10 (2).

Economic Science 4 (2), 5 (3), 6 (2), 9 (3), 11 (2), 13 (1), 14 (2), 18 (2), 20 (1), 21 (2), 22 (3).

Geology 2 (4), 6 (4), 9 (2), 607 (4), 805 (4).

Mathematics 9 (5), 10 (2), 16 (4), 18 (1), 23 (3), 26 (4), 28 (2), 29 (2).

Physics 615 (1), 617 (2).

Psychology 3 (3).

Zoology 3 (5), 6 (1), 7 (5), 8 (2), 10 (3 to 5), 13 (5), 14 (3), 17 (3).

General Subjects:

Domestic Economy 4 (2), 7 (2), 10 (2), 12 (2), 13 (1), 40.

English 12 (2).

History 4 (3), 5 (3), 6 (3), 9 (2), 11 (2), 20 (2), 21 (2).
Horticulture 11 (2), 31 (⅔).
Language 2 (5), 4 (3), 6 (5), 6a (3), 8 (3), 17 (3), 19 (3), 21 (3), 23 (2), 25 (3), 28 (3), 31 (5), 34 (3), 37 (3), 41 (2), 43 (2), 52 (3), 54 (3), 58 (3).
Literature, 2 (5), 3 (3), 7 (2), 10 (3), 11 (2).
Military 6 (1), 8 (1).
Physchology 2 (3), 3 (3), 4 (3), 5 (3), 6 (3), 7 (3), 8 (3), 9 (2).
Public Speaking 2 (1), 3 (2), 4 (2), 6 (2), 8 (1), 10 (2), 11 (2), 18 (1).

DEPARTMENT OF MATHEMATICS.

EDGAR WILLIAMS STANTON, PROFESSOR.
MARIA M. ROBERTS, ASSOCIATE PROFESSOR.
ERNEST ALANSON PATTENGILL, JULIA TRUEMAN COLPITTS, ASSISTANT PROFESSORS.
ANNA WILSON FLEMING, WARD MURRAY JONES, HELEN FLORENCE SMITH, AGNES GINA MOSHER, ELMER VERNON GRIGGS, INSTRUCTORS.
SUSIE KNUDSON, JOSEPHINE CALONKEY, STUDENT-ASSISTANTS.

The work of the Department of Mathematics is directed to the following ends:

(1) **The Development of Intellectual Strength.**—Such a degree of thoroughness is required as awakens interest and stimulates to earnest effort. The work is so arranged as to compel the student to abandon the mere mechanical methods of reaching results. He can make little or no progress except through the mastery of principles and methods; and in their application there is demanded of him a high degree of ingenuity, care, and courage. He is subjected to the continuous discipline of holding details in mind, comparing facts, drawing conclusions and advancing to the discovery of new truth. He learns to think, judge, originate, and through his mathematical training gains mental strength.

(2) **Accuracy in Presentation of Mathematical Truths.**—The student is required not only to think clearly, but to put his thought into concise and precise English. In the explanation of examples he is asked to bring out and emphasize the principles involved, dealing in detail with such equations only as are necessary to this purpose. In the solution of problems an analysis of statement and equation must be given, definitions and theorems must be stated clearly and accurately and in the demonstration of propositions the use of correct language is considered as secondary only to the employment of correct logic.

(3) **The Acquirement of Such Command of the Subject Matter**

of Mathematics as will make it a Valuable Instrument in Higher Scientific and Technical Study.—To this end an effort is made to eradicate from the student's mind the idea entertained by many that mathematical truths are learned simply to be forgotten, and to awaken in its place an earnest desire to obtain a comprehensive and abiding knowledge of the essential facts of the science. Thoroughness in daily recitation is demanded, frequent reviews are given and final credits are made to depend largely upon the student's grasp of principles and the readiness and the accuracy with which he performs the simple and the complex operations involved in their application. Each branch as it is taken up is so presented as to require the constant employment of the principles and facts of the preceding mathematical studies. The Department aims in this way to give the student such a degree of mathematical maturity and self-reliant mastery as will enable him to use his mathematical knowledge with profit either in advanced collegiate work or as an instructor in our high schools and academies.

COURSES IN MATHEMATICS.

4. College Algebra. Includes study of ratio, proportion, variation, the progressions, permutations, binomial theorem, convergency and divergency of series, theorem of undetermined coefficients including partial fractions, principles and use of logarithms, and the theory of equations. Open to graduates of fully accredited high schools. The first ten days of the semester is devoted to a review of algebra up to and including quadratics. Students failing in this test will be assigned to such work as they are fitted to pursue.

Graduates of accredited schools are earnestly urged to carefully review their work in algebra before entering this course. The sample questions printed elsewhere in this catalog give a good idea of the knowledge of the subject needed. The Department will gladly unite with the student and his school principal in arranging to test the thoroughness of his home review; such test can be given in connection with the work of the high school and if satisfactory to the Department, will be accepted in lieu of the review test at the College. The student can then begin his advanced work without delay. Students designing to take the review here must be present promptly at the opening of the semester. Correspondence regarding this whole matter is cordially invited.

Students not graduates of the fully accredited schools will be admitted to this course upon passing a satisfactory examination. Arrangements can be made with the principals of high schools or county superintendents to conduct such examinations. The principal of any school desiring to test the ability of his students to enter upon the work of this course will be furnished, upon request, a list of examination questions. The Department will be pleased to mark the examination papers and enter upon its records as accredited students in the

Mathematical Department the names of all students who show that they are prepared to take up the work with success. Recitations, five hours per week.

6. **Solid and Spherical Geometry.** Looking forward to this work the students immediately before leaving home should carefully go over the whole subject of plane geometry. The subjects considered in the course are the properties of planes, of diedral and polydral angles, of prisms, of pyramids and other polygons, of cylinders, cones and spheres, of spherical triangles and spherical polygons. Two hours' credit. Recitations, five hours per week, first six weeks.

7. **Spherical Trigonometry.** The spherical right triangle is investigated; triangles of reference are formed and formulas deduced therefrom; Napier's rules are applied; the six different cases arising in the solution of right triangles are discussed and illustrated by numerous examples. Spherical triangles in general are considered; the formulas relating thereto are derived and applied to the solution of examples; interesting problems connected with the celestial sphere are included in the course. Prerequisites, Courses 21 and 22 or 30. Two hours' credit. Recitation, four hours per week first half of the semester.

8. **Plane Analytic Geometry.** The subject is taught largely from the standpoint of its value as a disciplinary study. Once the student is impressed with the spirit of its method, the beauty of its logic and the excellent field for analytical reasoning it opens up, he will readily find a way to a mastery of the particular facts it reveals. The student is introduced to the subject through a review of the special algebraic, trigonometric and geometric conceptions upon which it is based. These are applied to the analytic representation of points in a plane and the proposition established that all geometric lines and curves can be represented by equations, and their properties and relations discovered by a study of these equations. The line, the circle and the conic sections are in this way most carefully investigated. Examples involving principles are solved and from a knowledge of particular the student is led to the demonstration of general theorems. The generalized truth is then employed in the development of other truth, and thus the student is given a most excellent drill in both inductive and deductive reasoning. At the same time his needs, as a scientific student, of a knowledge of the facts of analytic geometry are fully met. Text book, Analytic Geometry by Tanner and Allen, of Cornell University. Prerequisites, Courses 4 and 30. Recitations, five hours per week.

9. **Differential and Integral Calculus.** All preceding mathematical work should be completed before this course is undertaken. Calculus bears to that work the double relation that, while it is based upon it and cannot be pursued successfully except as the work has been well mastered, it on the other hand furnishes a most excellent opportunity for a general review of the preceding mathematical studies

and gives to all that has gone before a significance and value which it would otherwise lack. It is therefore a most important part of any extended and thorough mathematical course. The abstruse principles of this higher method of mathematical investigation are explained upon the theory of limits. The theory of infinitesimals is also employed. In differential calculus the rules of differentiations, expansion of functions, indeterminate forms, tangents, normals and asymptotes, direction of curvature, points of inflection, radius of curvature, order of contact, the osculating circle, envelopes, singular points and maxima and minima of functions are studied. In integral calculus much time is spent in acquiring a usable knowledge of the forms of integration. Application of integration is then made to the determination of the lengths of plane curves, areas of plane surfaces and the surfaces of revolution, volumes of solids of revolution and other solids. Recitations, five hours per week, with a review of week's work each Friday.

10. Differential Equations. Supplementary to integral calculus, including the formation of differential equations; solution of equations of the first order with applications to geometry, mechanics and physics. Prerequisite, Course 9 or 26. Two hours' credit. Recitations, five hours per week for the last seven weeks.

11. Advanced Differential Equations. Includes all subjects of Course 10 and in addition the study of the methods of handling linear equations with constant and variable coefficients; exact differential equations; integration in series; equations of the second order with geometrical, mechanical and physical applications; ordinary differential equations with more than two variables; partial differential equations of the different orders. Prerequisite, Course 9 or 26. Recitations, five hours per week.

15. Advanced Analytic Geometry. A study of the general equation of the second degree, higher plane curves and analytical geometry of three dimensions. Prerequisites, Courses 8 and 9. Two hours' credit. Recitations, four hours per week during last half of the semester.

16. Advanced Calculus. Deals with the application of differential calculus to the discussion of the properties of curves; the application of both differential and integral calculus to functions of a complex variable; and the subject of definite integrals and the use of double integration in measuring surfaces. The principles involved are illustrated by numerous examples. Prerequisites, Courses 8 and 9. Recitations, four hours per week.

17. Algebra and Trigonometry. The main object of this course is to so ground the student in the principles of trigonometry as to enable him to carry successfully his work in surveying, drainage and allied subjects. The course is intended to give the student sufficient knowledge of the subject to enable him to elect analytic geometry and calculus which are fundamental to certain lines of work in the agronomy course. The subjects investigated are definitions; positive and negative angles; circular measures of angles; operations upon angles; functions of angles, their relations and varying values; determination of values of the functions of particular angles; functions of different angles expressed in terms of those of a basal angle; derivation and reduction of trigonometric formulas; solution of right and oblique triangles. The points most strongly emphasized are: Care in tracing the trigonometric functions of varying angles in the different quadrants, readiness and skill in the derivation and reduction of trigonometric formulas and accuracy in the use of logarithmic tables. Three hours' credit.

18. **Mathematical Analysis.** Consists of lectures on the principles involved in the previous Mathematical courses. Its main purpose is to emphasize those principles which are most important and to suggest methods of presenting them effectively in the class room, thus helping those who expect to teach in mathematical lines. Prerequisites, all previous courses. One lecture per week.

19. **College Algebra.** This course is designed for students who after trial show lack of preparation sufficient to enable them to carry Course 20. By devoting an additional hour to Mathematics these students are enabled to thoroughly review the elementary algebraic processes, and at the same time complete the regular college algebra. Recitations, six hours per week.

20. **College Algebra.** Includes study of ratio, proportion, variation, permutations, the progressions, binomial theorem, convergency and divergency of series, theory of undetermined coefficients including partial fractions, principles and use of logarithms, and theory of equations. Prerequisites, same as for Course 4. Recitations, five hours per week during first twelve weeks of the semester.

21. **Plane Trigonometry.** Includes study of definitions; positive and negative angles; circular measure of angles, functions of angles, their relation and varying values; determination of functions of different angles expressed in terms of those of a basal angle; solution of trigonometric equations and the proving of identities. Prerequisites, Courses 6 and 20. Recitations, five hours per week during last four weeks of the semester.

22. **Plane Trigonometry.** Includes those subjects of the usual courses in trigonometry not included in Course 21; namely, the derivation of the formulae relating to the sum and difference of two angles, functions of double angles and of half angles with identities and equations based upon these formulae and the solution of right and oblique triangles. Prerequisites, Courses 20 and 21. Recitations, five hours per week during first seven weeks of the semester.

23. Plane Analytic Geometry. The work covered is the first eight chapters in Tanner and Allen's Analytic Geometry. Prerequisite, Course 22. Three hours' credit. Recitations, five hours per week during last twelve weeks of the semester.

24. Plane Analytic Geometry. The work covered is chapters IX, X, XI in Tanner and Allen's Analytic Geometry. This course, together with Course 23 which precedes it, covers the same ground as Course 8. Prerequisite, Course 23. Two hours' credit. Recitations, five hours per week during first four weeks of semester.

25. Calculus. The work covers the rules of differentiation, together with numerous examples illustrating their use and a large number of problems showing the close relation of differential calculus to physics and mechanics, also its application to the expansion of functions and to indeterminate forms. In Integral Calculus, the rules of integration are derived and enforced by a sufficient number of examples to make this most efficient tool of the engineer thoroughly ready for his later use. Prerequisite, Course 24. Three hours' credit. Recitations, five hours per week last twelve weeks of semester.

26. Calculus. The work covered in differential calculus includes tangents, normals, asymptotes, direction of curvature, points of inflection, radius of curvature, order of contact, osculating circle, envelopes, singular points, and mixima and minima; in integral calculus, applications are made to obtaining lengths of plane curves, areas of plane surfaces, and surfaces of revolution, volumes of solids of revolution and other solids. Prerequisite, Course 25. Recitations, four hours per week.

27. Spherical Trigonometry. Covers same ground as Course 7. One and a half hours' credit. Recitations, four times a week for seven weeks.

28. Determinants and Theory of Equations. The course includes, in determinants, the evaluation of determinants, solution of equations by determinants, and multiplication of determinants; in theory of equations the subjects covered are limits of roots, location of roots, multiple roots, Sturm's Theorem, and solution of higher equations. Prerequisites, Courses 4 and 30. Recitations, two hours per week.

29. Calculus. Includes those parts of Mathematics 25 and 26 not included in Course 9. Prerequisite, Course 9. Recitations, two hours per week.

30. Plane Trigonometry. The subjects covered are the same as those included in Course 17, with the exception that since the students taking this course have had considerable previous work in logarithms, more time is devoted to identities and the solution of trigonometric equations. Prerequisites, Courses 4 and 6. Three hours' credit.

DEPARTMENT OF GENERAL AND APPLIED CHEMISTRY.

ALFRED ALLEN BENNETT, PROFESSOR.
LOLA ANNE PLACEWAY, AND WINNIFRED FORREST COOVER, ASSOCIATE PROFESSORS.
LOLA STEPHENS AND LAURA MAY TAGGART, INSTRUCTORS.
CHESTER CHARLES FOWLER, JESSE MC KEEN, ORIN L. KIPP, SOPHIE HARGIS AND NELLIE NAYLOR, ASSISTANTS.

The aim of the instruction in Chemistry is to develop in the student the inductive and experimental method of study, to excite in him an appreciation and love for true experimentation and to train his powers for inductive thinking, thus laying a foundation for technical or applied Chemistry.

The method of study is, therefore, distinctively the laboratory method. On the average, the student employs two hours of time in laboratory study for every hour of recitation. This proportion of time for the two divisions of work is especially carried out in the earlier part of the class study. The class room work aids to fix in the mind of the student chemical principles and facts based upon what has been learned by the actual handling and study of chemical substances.

Equipment and Accommodations.

The Chemical department occupies the whole of the four floors of the building known as Chemical Hall. The building is "T" shaped with a front of 70x40 feet and a wing of 60x32 feet and contains twenty-seven rooms, ten of which are laboratories, the remainder being lecture, office, balance and store rooms.

The laboratories contain working tables which by a system of lockers accommodate 650 students. The assaying laboratory is well supplied with tables, furnaces and other apparatus for fire assaying. The laboratory for the course in blow piping is fitted with air blast and all of the usual conveniences for such laboratories.

The department is well supplied with accurate weights and balances for the courses involving quantitative analysis.

Persons desiring to prepare themselves to become teachers of chemistry, analytical chemists, food inspectors, or those seeking a preparation for the study of medicine will find here good facilities for study. The latter class of students who intend later to enter some medical college are recommended to take the following courses subsequently described: Courses 2, 59 and 36. The latter course (36) is most successfully pursued if it is also preceded by Course 11. Some of the courses that may be grouped into a consistent line of work in this subject are as follows: For the freshman year, Courses 2 and 5; sophomore year, Courses 51, 52, and 9; junior year, Courses 11, 48, 32, and 31; senior year, Courses 53, 19, 18, 17, and 54.

During the last year and a half of work, the courses may be varied considerably. For example, in the second semester, junior year, 32 and 34 may be combined. Senior year, Courses 14, 18, 47, and 36 may be combined. Other combinations of courses can be arranged after the work is under way, but in general, the number of hours devoted to the subject will be as indicated in the courses just given. (See under title "Industrial Chemistry.")

A thesis is also required, which will grow out of some of the special studies.

Students completing the required number of credits will be given the degree of Bachelor of Science in Chemistry.

Description of Courses in Chemistry.

The work in Chemistry is conveniently grouped under the following general heads: (a) General and Descriptive Chemistry; (b) Analytical Chemistry, Qualitative and Quantitative Analysis; (c) Organic Chemistry; (d) Studies in Applied Chemistry.

(a) **General and Descriptive Chemistry** includes an elementary study of the non-metallic and metallic elements, their history, occurrence, preparation, properties and their principal compounds. In order better to train his powers of observation the student is required to describe the apparatus used and the phenomena produced, and to trace the relation of the results obtained to laws and principles.

The different courses in General and Descriptive Chemistry are arranged to meet, as far as practicable, the special needs of the students of the various departments. However, it is recognized that at this stage of the work the **Science of Chemistry** is the student's most practical acquisition and that for him laboratory study is the best source of the facts for the development of this science. An elementary course in Physical Chemistry is included under this head and covers, in an elementary way, the study of the facts in the border land between Physics and Chemistry and is offered to the student as an aid in developing and comprehending the science of chemistry.

(b) **Analytical Chemistry,** both **Qualitative** and **Quantitative,** is taken up in an elementary way at first and may be followed by courses in more advanced work. After this preliminary knowledge is obtained, the direction of the work will depend to a great extent on the degree the student is aiming to obtain. For the degree in **Agriculture** the analytical study is directed to an examination of those substances of agricultural interest, and to prepare the student for an intelligent use of the scientific data upon which agriculture is founded. In any case the purpose is to study Applied Chemistry from the standpoint of its fundamental principles.

In the recitations, methods of analysis are described and discussed, and the study of the theoretical chemistry carried forward. In this work, courses of study are arranged for graduate as well as for undergraduate students.

(c) In **Organic Chemistry**, courses are offered for the first degree and also as major and minor subjects for graduate students.

The course required of the students in the Division of Veterinary Science is of an elementary nature and is intended to give a sufficient knowledge of the subject to lay the foundation for the study of Physiological Chemistry which follows. The latter course considers the chemical changes going on in the living animal body: the essential composition of foods and the changes through which they pass in the animal economy; the chemistry of the secretion and excretion. The laboratory study is devoted to the three principal food constituents and to urine analysis.

The undergraduate in the Division of Agriculture under the topic, Organic Chemistry, studies in addition to the general principles of the subject, the chief food substances, i. e., the carbo-hydrates, fats, and proteids, poisonous substances found in the organic world, such as the alkaloids, ptomaines; the chemistry of milk and of the manufacture of butter and cheese. In a word, the student will consider, as completely as the time allotted to the subject will allow, the important questions that concern agriculture from the chemical standpoint.

To undergraduate students in the Division of Science is given a fairly complete outline of the theory of the structure and formation of organic compounds, but special attention is given to those compounds that are of commercial importance. In the laboratory the student prepares many of the more important manufactured organic substances, such as alcohol and soaps, and makes a special study of vinegars, sugar, petroleum and its products, glycerine, etc.

With this work as a foundation the graduate student selects some feature or features for more complete study. The amount and character of the work is left for arrangement between the individual and the head of the department. However, this will embrace such work as the analysis and study of foods, oils, fats, and the methods of preparation, purification, and adulteration of commercial organic substances.

(d) **Applied Chemistry.** It is recognized among persons whose opinions are worthy of consideration that the application of any science to the problems of life can be profitably taken up by the student only after a thorough grounding in the principles upon which the science rests. The purpose of the preliminary courses in this subject is to give this training as completely as possible.

Some thirty-two courses of study in applied chemistry are offered, or are required of the students for the various degrees open to them. In the nature of the case, this work is essentially quantitative analysis and consists of courses in the analysis of Agricultural products; Fuel and Gas Analysis; Blowpipe Analysis; Assaying; Chemistry of the Household; The Preparation of Organic and Inorganic Compounds.

The courses in Agricultural Analysis include both inorganic and organic substances such as: Soils, fertilizers, water, fodders, and dairy products. This work is open to undergraduates and graduate students, i. e., the latter class of students will carry forward the work begun in the usual college courses.

The course in Fuel and Gas Analysis consists of the study of solid, liquid, and gaseous fuels, in reference to their composition, and to their relative economic values. The student may devote the time of this course, principally, to technical analysis. The principles and methods of quantitative analysis learned in the elementary courses will be applied in the advanced work to the analysis of various organic and inorganic substances, such as foods, iron, and steel. The application of the facts of Electro-chemistry to the quantitative analysis of ores, and in the manufacture of chemicals will be studied in an elementary manner. Although the work is mostly done in the laboratory, it will be supplemented by lectures and recitations.

Quantitative Analysis by "fire methods," or, as it is commonly called, Assaying, is applied to gold, silver, copper, and lead ores.

The courses in chemical preparations will include the formation of pure and commercial articles from raw materials, and the common adulteration of these products.

The work in Physiological Chemistry for the student in the Science Division (Course 36) includes a careful study in the laboratory, of the composition of foods, the chemical characteristics of their constituents, the changes during digestion and assimilation, and the products of metabolism. The class room work correlates these facts and by lectures and text book they are given their appropriate explanation.

The work in Water Analysis covers a study of the methods employed, namely, the so-called mineral and sanitary analysis, and the interpretation of these results, especially from the standpoint of the household, and for use in boilers in the production of steam. Methods of purification of water and a study of sewage will receive attention.

In each course in Chemistry, except Courses 10, 28 and 29, a deposit of $5.00 is charged to cover cost of materials used and breakage The deposit is $3.00 for Courses 28 and 29.

COURSES IN CHEMISTRY.

1. Elementary Inorganic Chemistry. Three hours' credit. Recitations, two hours, and laboratory, one period, per week. Deposit, $5.00.

2. General Chemistry. Five hours' credit. Recitations, three hours, and laboratory, two periods, per week. Deposit, $5.00.

4. General Chemistry (Metals). Three hours' credit. Recitations, two hours, and laboratory, one period, per week. Deposit, $5.00.

5. Qualitative Analysis. Continuation of Course 2. Five hours' credit. Recitations, three hours, and laboratory, two periods, per week. Deposit, $5.00.

9. Organic Chemistry. Prerequisite, Course 5 or 24. Five hours' credit. Recitations, four hours, and laboratory, one period, per week. Deposit, $5.00.

10. Elementary Organic Chemistry. Lectures, two hours per week.

11. Quantitative Analysis. Prerequisite, Course 5 or 24. Five hours' credit. Recitations, three hours, and laboratory, two periods, per week. Deposit, $5.00.

13. Physiological Chemistry. Recitations, two hours, and laboratory, one period, per week. Deposit, $5.00.

14. Organic Chemistry. Continuation of Course 9, subject to arrangement by head of department and pupil. Five hours' credit. A major or minor graduate study. Deposit, $5.00.

22. Elementary Chemistry. Five hours' credit. Recitations, three hours, and laboratory, two periods, per week. Deposit, $5.00.

24. Elementary Applied Chemistry. Five hours' credit. Recitations, three hours, and laboratory, two periods, per week. Deposit, $5.00.

31. Inorganic Preparations. Prerequisite, Course 9. Four hours' credit. Recitations, two hours, and laboratory, two periods per week. Deposit, $5.00.

32. Quantitative Analysis. Continuation of Course 11. Four hours' credit. Deposit, $5.00.

35. Organic Preparations. Prerequisite, Course 9. Four hours' credit. Recitations, two hours, and laboratory, two periods, per week. Deposit, $5.00.

36. Physiological Chemistry. Prerequisite, Course 9. Five hours' credit. Recitations, three hours, and laboratory, two periods, per week. Deposit, $5.00.

39. Water and Sewage Analysis. Recitation, one hour, and laboratory, two periods, per week. Prerequisites, Courses 41 and 49 or 45. Deposit, $5.00.

41. General Chemistry. Recitations, two hours, and laboratory, one period, per week. Deposit, $5.00.

42. General Chemistry. Continuation of Course 41. Recitations, two hours, and laboratory, one period, per week. Deposit, $5.00.

43. Qualitative Analysis. Continuation of Course 42. Three hours' credit. Recitations, one hour, and laboratory, two hours, per week. Deposit, $5.00.

45. Analytical Chemistry. Two hours' credit. Deposit, $5.00.

46. Elementary Quantitative Analysis. Four hours' credit. Deposit, $5.00.

47. The Chemistry of Foods and Food Adulteration. Prerequisites, Courses 5 or 9 and 11. Five hours' credit. Three recitations or lectures and two laboratory periods. Deposit, $5.00.

49. Study of Metals. Four hours' credit. Deposit, $5.00.

50. Quantitative Analysis. Five hours' credit. Deposit, $5.00.

51. Advanced Qualitative Analysis. Prerequisite, Course 5. One recitation and two laboratory periods per week. Deposit, $5.00.

52. Physical Chemistry. Prerequisite, Course 5. One recitation and one laboratory period per week. Deposit, $5.00.

AGRICULTURAL CHEMISTRY.

ALFRED ALLEN BENNETT, PROFESSOR.
WINNIFRED FORREST COOVER, ASSOCIATE PROFESSOR.
CHESTER CHARLES FOWLER, ASSISTANT.

The aim of the work in Agricultural Chemistry is twofold; namely, to give the student a fundamental knowledge of chemistry, and then to apply this knowledge to the chemical problems of agriculture.

Throughout the courses in Agricultural Chemistry, the study of chemical principles and relations is accompanied by its application to agricultural questions.

Courses in Agricultural Chemistry.

21. Elementary Experimental Chemistry. This is introductory work intended to give knowledge of matter by actual handling and experience with it. Includes study of so-called non-metallic elements present in air and soil. The recitations review the work of the laboratory, the student learning how to take useful notes, their interpretation and application to common chemical changes occurring in nature. Five hours' credit. Recitations, three hours, and laboratory, two periods, per week. Deposit, $5.00.

23. Elementary Experimental Chemistry. Continuation of Course 21. A study of the metallic or basic elements, their relation to nonmetallic elements or the acids, and their place in formation of salts; the separation and recognition of these elements and their compounds preparatory to determining them quantitatively. Five hours' credit. Recitations, three hours and laboratory, two periods, per week. Deposit, $5.00.

25. Agricultural Analysis. A study of the fundamental principles of organic chemistry; the proximate composition of the various grains, root and fodder crops; the composition and changes occurring in farmyard and other manures; and the chemistry of assimilation and digestion. The laboratory work includes the preparation and study of a limited number of organic compounds, and study of carbohydrates, fats and proteids. Prerequisite, Course 23. Four hours' credit. Recitations, three hours, and laboratory, one period, per week. Deposit, $5.00.

26. Agricultural Analysis. Includes preliminary work involving the principles of gravimetric and volumetric analysis, followed by analysis of fertilizers, grain and mill feeds and fodders. Prerequisite, Course 25. Four hours' credit. Recitations, two hours, and laboratory, two periods, per week. Deposit, $5.00.

27. Agricultural Chemistry. A continuation of Course 26. This outline is offered to those who wish to continue their chemistry along analytical or industrial agricultural lines. Credit three or five hours. Recitations or lectures one or two hours and laboratory study two or three periods. Deposit, $5.00.

The work may be grouped as follows:

(a) Analysis of sugar and saccharine products. Includes lectures on cane and beet sugar, manufacture and methods of chemical control.

(b) Analysis of fruits and fruit products, vinegars, and alcoholic beverages.

(c) Chemical and microscopical analysis of stock foods.

(d) Analysis of oils, fats, waxes, and soaps.

(e) Analysis of soils.

(f) Analysis of fuels, water for sanitary and boiler purposes, and lubricants.

28. Dairy Chemistry. An elementary course arranged to fit the needs of the students in this course. Two lectures with accompanying experimental study. Two hours' credit. Deposit, $3.00.

29. Dairy Chemistry. Second semester, One Year Dairy Course. Two lectures with accompanying experimental study. Two hours' credit. Deposit, $3.00.

34. Advanced Agricultural Chemical Analysis. A continuation of Courses 27 and 40. This course is offered to those who wish to specialize in agricultural chemistry or do research or experimental work. An amount of work necessary for the required credits may be chosen from groups outlined, or work especially outlined may be selected,

(a) Analysis of meats and meat products.

(b) Analysis of tea, coffee, cocoa and cocoa products.

(c) Analysis of canned fruits and vegetables.

(d) Detection and determination of food preservatives and coloring matters.

(e) Analysis of insecticides and fungicides.

(f) Calorimetry of solid, liquid and gaseous fuel foods.

(g) Analysis of paints and varnishes.

Credit, five hours. Recitations, two hours, laboratory study, three periods. Deposit, $5.00.

40. Dairy Chemistry. Analysis of pure dairy products; also a qualitative and quantitative analysis of adulterated products; the detection of the preservatives and coloring matters commonly used. Reference book, Richmond's "Dairy Chemistry.". Prerequisite, Course 26. Four hours' credit. Recitations, two hours, and laboratory, two periods, per week. Fee, $5.00.

56. Food Inspection and Analysis. The purpose of the course is to familiarize the student with methods of food inspection and to continue the analytical work along more advanced lines so that he may be prepared to take up government or other food inspection work. Leach's Food Inspection and Analysis will be used as a guide with references to Winter's Microscopy of Vegetable Foods and Hanausek's Microscopy of Technical Products. Prerequisite, Course 40. Credit, five hours

INDUSTRIAL CHEMISTRY.

ALFRED ALLEN BENNETT, PROFESSOR.
WILLIAM MILTON BARR, ASSISTANT PROFESSOR.

The great importance of Industrial Chemistry has led to the bringing together here of the courses offered to students under the title, "Industrial Chemistry." These courses are intended to prepare the student pursuing them to fill positions as chemists in the various manufacturing industries. The following described courses are open for election by students who are candidates for the degrees in the Divisions of Science and of Engineering. Students who complete the required number of these courses in connection with the required credits in other courses will receive the degree of Bachelor of Science in Industrial Chemistry.

Students who are candidates for this degree will apply to the Dean of Engineering and the head of the Chemical Department who will arrange the course required for it. See under Division of Engineering, page 245.

Courses in Industrial Chemistry.

32. (401.) Advanced Chemical Analysis. The student may select work in the following divisions of analytical chemistry: The analysis of fuels, gas, water, iron, steel and other commercial alloys, and a variety of industrial products. Prerequisite, Chemistry 46. One recitation and three laboratory periods per week. Four hours' credit.

53. (602.) The course consists of lectures and recitations upon the general operations common to many chemical industries, the types of apparatus used for carrying out such processes upon a commercial scale, and some of the more important industries involving chemical processes, such as the production of alkali, acids, fertilizers, glass, cement, soap, paper, explosives, etc. Prerequisite, Chemistry 9. Text book, Thorp's Outlines of Industrial Chemistry. Lectures and recitations five hours a week.

54. (703.) Technical Laboratory. A laboratory course based upon the work in Industrial Chemistry 602, giving practice in the preparation and purification of chemical products on a scale such as to afford data for the determination of the cost and economy of manufacture. The student is given problems of practical importance, for the solution of which he obtains data from experiments with typical forms of manufacturing apparatus. The student thus becomes familiar with the use of large-scale apparatus and gains a knowledge of the properties of substances used, and of the difficulties in manufacture. Prerequisites, Industrial Chemistry 32 and 53. Four afternoons a week. Four hours' credit.

55. (804.) A study of chemical machinery and process work, accompanied by reports and a special study to be made a subject for a thesis. Visits to a number of manufacturing plants will be made by those taking this course. Prerequisite, Industrial Chemistry 54. Four hours' credit.

18. (805.) Electro-Chemistry. Lectures and laboratory practice on the application of the electric current to chemical processes and chemical analysis. Text book, Smith's Electro-Analysis. Prerequisite, Industrial Chemistry 703. Two hours' credit.

DEPARTMENT OF BOTANY.

LOUIS HERMANN PAMMEL, PROFESSOR.
ESTELLE FOGEL-BUCHANAN, ASSISTANT PROFESSOR.
ROYAL E. JEFFS, INSTRUCTOR.
HARRIETTE S. KELLOGG, CURATOR OF THE HERBARIUM.
JOHN ROY CAMPBELL, ASSISTANT.

The Department of Botany occupies the major portion of the third and several rooms on the fourth floor of the new Central Building. Sixteen well-lighted and equipped rooms are devoted to the work of this department.

The laboratory for Elementary Students, accommodating thirty students each period, is well equipped with individual laboratory tables, lockers, dissection microscopes, water, gas, reagents, etc.

Laboratory for Histology and Pathological Botany, accommodating thirty students each period, is equipped with separate laboratory tables, individual compound microscopes, lockers, wall cases, water and gas, and an abundance of fresh and preserved material for study.

The Laboratory in Cytology, accommodating eight students, is equipped with heavy laboratory tables supplied with water, gas, Leitz triple objective microscopes, paraffine baths, microtomes, stains, reagents, and abundant facilities for all kinds of cytological investigations.

The Laboratory for Physiological Botany is equipped with the necessary apparatus for a systematic study of the functions and activities of plants and their parts. Will accommodate eight students.

Latoratory for Special Botanical Drawing is primarily intended for students writing theses in this department and for post-graduates.

The Laboratory for Economic Botany is equipped with dissecting and compound microscopes and with an excellent economic herbarium.

A well-lighted room on the fourth floor, used as pathological and physiological greenhouse laboratory, supplies an abundance of fresh material for class and laboratory work.

The lecture room is equipped with a very complete outfit for lantern demonstrations, both slides and lantern views.

HERBARIUM. The department now has about ninety thousand mounted and cataloged specimens in the herbarium. These consist of 44,000 in the General Phanerogamic Collection, 25,000 in the Parry Collection, 5,000 in the General Cryptogamic Collection, 15,000 in the Cryptogamic Exsiccati, and 1,200 in the Seed Collection. These specimens were collected in the Mississippi Valley, in Iowa, in particular, also in the Eastern States, the Rocky Mountains, the Pacific Coast and in Europe. The collection of Phanerogams was commenced under Dr. Bessey and continued under Dr. Halsted. Beside this there is the Parry Collection, Cryptogamic Herbarium, the Holway Herbarium (excepting the Uredineae), the Fink Herbarium (excepting the Lichens), and the Andrews Collection.

Grass Collection. This collection contains excellent material from every part of the state and various parts of the United States and Europe. It is invaluable to the student in Agrostology.

Parry Collection. This collection contains hundreds of new species found by Dr. Parry on his collecting trips and is especially rich in the plants of California, Mexico, and the Rocky Mountain Region. Most of these were collected before the advent of the railroad, many are types and hence invaluable.

Dendrological Collection. The herbarium also contains a very excellent collection for dendrological study, many of the trees being represented by photographs and wood specimens. The cases in which the herbarium is placed are made of about fifty species of wood native to the United States.

Economic Collection. This collection consists of very complete sets of the various plants of economic importance, either as the friends or foes of man, including a collection of weeds and poisonous plants.

Seed Collection. This contains the sets of seeds distributed by the U. S. Department of Agriculture, several sets of German weed seeds, and a large collection of the seeds of various cultivated and wild plants. This collection is of the greatest value in the study of seed adulteration.

Cryptogamic Collection. This collection contains a large number of very valuable exsiccati, the Ravenel Fungi Americana, Ellis North America Fungi, the von Thuemen Mycotheca Universalis, those of Sydow, Krueger, Seymour, and Earle, and numerous smaller collections.

THE MUSEUM. The department has a large amount of material incorporated into an Economic Museum. The collections are systematically grouped, showing in many cases the evolution of the finished product from the crude material, especially of the fiber products. There is also a collection of the various edible and poisonous fungi in formalin.

For graduate work, the department offers unusual facilities, major or minor work being offered to supplement that of the various scientific courses.

COURSES IN BOTANY.

5. **Vegetable Pathology.** Study of the plant diseases of the various horticultural, garden, and farm crops from the standpoint of the host plant; also, theories of prevention of disease, of rotation of crops, and the use of fungicides. Prerequisite, Course 27 for Science students, Course 11 for Agricultural students. Three or five hours' credit. Lectures, two hours, and laboratory, three or nine hours, per week. Fee, $3.00.

6. **Advanced Cryptogams.** Lectures and laboratory work on the various non-vascular crytogams, particularly the fungi of our native flora; also laboratory investigation of a single group from both pathological and systematic point of view. Prerequisite, Course 28. Three hours' credit. Lecture, one hour, and laboratory, six hours, per week Fee, $3.00.

9. **Structural Botany.** This course is designed for Veterinary students, it being necessary that the well-equipped Veterinarian have a knowledge of the terms used in morphological botany, and of the microscopic structure of plants. Vegetable drugs may consist of the whole plant, but more frequently of parts only, and hence the detection of adulterants is a subject for microscopic determination. Thus this course includes a study of parts of the plant from the root to the reproductive organs; with laboratory study of the histology of plants, especially from the standpoint of pharmacognosy, with a brief survey of more important groups from a systematic standpoint. Three hours' credit. Lectures, two hours, and laboratory, three hours, per week. Fee, $3.00.

10. **Economic Botany.** A microscopic study of various plants and their food products and adulterants; the reserve food of plants, its form and use, and a systematic study by groups of the plants of economic value and a study of their origin and place of cultivation. Prerequisite, Course 27. Two hours' credit. Lecture, one hour, and laboratory, three hours, per week. Fee, $3.00.

11. Vegetable Physiology. Lectures and laboratory practices on the functions, growth, nutrition, irritability, movements and reproduction of plants. Four hours' credit. Lectures, two hours, and laboratory, three hours, per week. Fee, $3.00.

12. Vegetable Cytology. A study of the plant cell and its activities, use of various reagents in staining, imbedding, mounting; various cell-like phenomena as they aid in an intelligent understanding of various problems in heredity and as illustrating DeVrie's Theory of Mutations and the relation in general of the hybrid and the cross to the parent. Prerequisite, Course 11 or 27. Four hours' credit. Lectures, two hours, and laboratory, six hours, per week. Fee, $3.00.

13. Agrostology. A systematic study of the botanical position and economic uses of important grasses, as those used in meadows and pastures, cereal food products, grasses in medicine, as soil binders and for lawn making. Two hours' credit. Lecture, one hour, and laboratory, three hours per week. Fee, $3.00.

14. Seeds and Seed Testing. Study of principal agricultural seeds and weeds, methods of detection of weeds in commercial seeds, and structure and germinative energy of various seeds. Prerequisite, Course 11 or 27. Two hours' credit. Lecture, one hour and laboratory, three hours, per week. Fee, $3.00.

15. Systematic Phanerogams. Study of the more important orders of flowering plants; historical survey of various systems of classification; study of groups by means of some representative, the herbarium of the College affording material for this purpose. Three to five hours' credit. Lectures, two hours, and laboratory, three to nine hours, per week. Fee, $3.00 or $5.00.

16. Poisonous Plants. Study of poisonous plants from historical standpoint, with brief history of toxicology, ptomaine poisoning and poisoning by toxins and other agents—beginning with the poisonous fungi extending through the higher plants in systematic order. The course is intended to acquaint veterinarians with the plants responsible for poisoning animals. Two hours' credit. Lecture, one hour, and laboratory, three hours, per week. Fee, $3.00.

17. Advanced Cryptogamic Botany, Ferns. Morphological and Systematic study of ferns and their allies. Prerequisite, Course 28. Three hours' credit. Lecture, one hour, and laboratory, six hours per week. Fee, $2.00.

18. Botanical Seminar. Recent literature and topics of botanical interest are reported and discussed by members of seminar, each member reporting on some assigned topic at least once every two weeks. Lectures are also given by members or by some scientist under the auspices of the seminar. One hour credit.

19. Evolution of Plants. Study of theory of evolution of plants, heredity, mutation, Mendelian laws, present and past distribution of plants as related to origin of species. Prerequisite, Course 15. Two hours' credit. Recitation, one hour, and laboratory, three hours, per week. Fee, $3.00.

23. **Thesis.** Consists of original research along line of any preceding courses, laboratory work, preparation of bibliographies, reviewing literature pertaining to the subject, and conferences with those in charge. Credit from one to five hours per week. Fee, $3.00.

24. **Plant Embryogeny.** The phenomena of cell division, the nuclear changes of the cell at different stages in its growth, a survey of life history of various groups of plants beginning with liver-worts, the gradual development of the alternation of generations in various types, the homologies of the parts of flower and its various contained structures, processes of maturation of germ cells, growth of the gametophytic generation and the final process of fertilization and the consequent development of embryo, cytological explanations of the laws of Mendel, of parthogenesis, of xenia, and polyembryony, also the study and verification of lectures by study of a series of slides. One hour credit. Fee, $2.00.

25. **Microscopical Examination of Foods.** This course embraces a study of vegetable foods from the standpoint of microscopy with especial reference to the adulteration of the same. It takes up the histological elements of plants such as tissues and cell contents. A microscopic study of flour and meal, impurities and adulterations, and the microscopic characters of the cereals such as wheat, oats, and corn. A study of weed seeds and screenings, oil seeds and oil cake. A microscopic study of legumes like the common bean, pea, and vetch; other fruits like the apple, pear, and quince; cucurbit fruits; tubers; spices, and condiments, like pepper, cubebs, cinnamon, nutmeg, and mace. Lectures and laboratory work. Reference book, "The Microscopy of Vegetable Foods," by Winton and Moeller. Two hours per week. Fee, $3.00.

26. **Ecology.** Treats of the relation of plants to their environment, under the factors water, heat, light, air, soil, and animals; considering the anatomical structures of plants, especially with reference to environment. The pollination of some economic plants like maize, wheat, clover, rosaceous and leguminous plants; the dissemination of plants. Symbiosis. Myrmecophytes. Two hours' credit. One lecture and one laboratory. Fee, $3.00.

27. **General Botany.** A study of the general morphology with a short resume of the systematic arrangements of important members of five divisions of the plant kingdom; also a brief consideration of some of the functions of plants, under the head of the stability of plant bodies, the movements, nutrition, growth and reproduction. Reference books, Strasburger, Noll, Schenck, and Karsten. A text book of Botany; Stevens' Plant Anatomy. Five hours' credit. Lectures, four hours, and laboratory, three hours, per week. Fee, $3.00.

28. General Botany. A study of the special morphology of the plant, beginning with the cell, its structure, parts, the inclusions of protoplasm, such as starch, aleurone, and crystalline matter; a brief account of the ontogeny of the cell and cell fusion; also a study of the tissues and tissue systems and their functions. Prerequisite, Course 27. (Reference books same as Course 27.) Five hours' credit. Lectures, four hours, and laboratory, three hours, per week.- Fee, $3.00.

29. General Botany. In this course the relation of plants to their environment is considered, and the pollination of flowers by the insects, wind, and other agencies, dissemination of plants, and a study of the different plant formations. This part of the work will be followed by a study of the use of the microscope, a study of the cell and its contents, such as starch, protoplasm, nucleus, and crystals, tissues and tissue systems. These structures are taken up from physiological standpoint, the use and function of the different plant structures is considered, and the absorbing, assimilating, aerating, and conducting systems are considered. Five hours' credit. Four lectures and one laboratory. Fee, $3.00.

60. Botany of Weeds. This is a systematic course of the study of weeds, especially with reference to their injury to farm, garden, and horticultural crops, and the origin and distribution of weeds. Two hours' credit. One lecture and one laboratory. Fee, $3.00.

DEPARTMENT OF ZOOLOGY.

HENRY ELIJAH SUMMERS, PROFESSOR.
JOSEPH EDWARD GUTHRIE, C. E. BARTHOLOMEW, ASSISTANT PROFESSORS.
HENRY NESS, HENRY ELLSWORTH EWING, INSTRUCTORS.
C. R. SHUMWAY, STUDENT-ASSISTANT.

Equipment. The laboratory is well supplied with the usual apparatus, including compound and dissecting microscopes, camera-lucidas, microtomes, incubators, paraffin baths, aquaria, etc. In the way of illustrative material, in addition to the general museum and the entomological collections described below, there is a large series of charts, a set of wax embryological models, lantern slides, mounted microscopic slides, disarticulated and articulated skeletons, and alcoholic and formalin preparations.

The general museum consists of specimens selected with great care to show the variation of structure found in the various branches, classes, and minor divisions of the animal kingdom. Porifera, coelenterata, vermes, echinodermata, arthropoda, mollusca and vertebrata are amply represented by actual specimens and Blaschka glass models. It is especially rich, however, in representative birds and mammals. In addition to a good series of skeletons, there are mounted skins of about two hundred, and eggs of over two hundred species of birds, and over ninety mounted skins of mammals, the latter including such rare or peculiar forms as the echidna, ornithorhynchus, great kangaroo, kaola, wombat, sloth, great ant-eater, armadillo, manatee, peccary, camel, antelope, bison, Rocky Mountain goat and sheep, elk, tapir, porcupine, beaver, fur seal, hedgehog, lemur, and monkey.

The collection of insects is very large, embracing about sixty thousand mounted specimens, including a large number of types. It includes the Van Duzee collection of Hemiptera, including the types of numerous species described by him. There is also a large series of microscopic forms on slides, and a large amount of material illustrating life histories, especially of injurious insects.

The work in Zoology is designed, first, to give a knowledge of those biological laws, together with the data necessary for their thorough comprehension, which is today regarded as an essential part of a liberal education; second, to furnish the requisite theoretical basis for an intelligent study of certain practical branches of stock breeding, dairying, human and veterinary medicine, and economic entomology, which depend directly upon zoological principles; and, third, to impart a knowledge of the facts and methods of investigation in the last of these practical subjects, namely, economic entomology.

COURSES IN ZOOLOGY.

2. **General Zoology.** This, together with Zoology 3, is designed to give an outline knowledge of the entire animal kingdom, as well as of the more important biological laws. The laboratory work includes a thorough study of the structure of the grasshopper, followed by a comparative study of certain parts of the beetle. The lectures during the corresponding time deal with those facts in the physiology and life history of insects that will best serve as a foundation for a knowledge of the general laws of animal life. This, followed by a study of the crayfish and crab, gives a basis for comparison between the Crustacea and Insecta. The earthworm is next studied, the lecture work dealing with the relations of animals to their environment. Vertebrates are next studied, the lecture work dealing with the anatomy of the shark and the lectures with general vertebrate physiology, including the fundamentals of embryology. The study of the vertebrate is continued by examinations of the perch, necturus, frog, turtle, bird and mammal. The Protozoa are next studied, the lectures dealing with the origin of the physiological functions as exhibited in this group. Then a study is made of selected types of the different phyla of the animal kingdom, taken up in regular order until the vertebrates are again reached. Five hours' credit. Lectures, three hours, and laboratory, six hours, per week. Fee, $3.00.

3. **General Zoology.** Continuation of Course 2. Five hours' credit. Lectures, three hours, and laboratory, six hours, per week. Fee, $3.00.

4. **General Entomology.** A study of the structure, habits, life history, and classification of insects, designed as an introduction to the subject for those intending to make a specialty of entomology and as a foundation for the practical work in economic entomology offered in Courses 17 and 18. Includes a detailed study of certain representative forms, beginning with the grasshopper, and the field study, collection and classification of as many species as possible representing different orders. The lectures include the general principles of the physiology and development of insects and the detailed life history of representatives of all the different orders. Prerequisite, Zoology 3 or 16. Four hours' credit. Lectures, two hours, and laboratory, six hours per week. Fee, $3.00.

5. **Embryology.** The laboratory work is devoted to a study of the development of the frog and of the chick from preparations made largely by the student, supplemented by others furnished for comparison by the instructor. The methods of making reconstructions from serial sections may be learned. In the lectures the general principles of development are discussed, beginning with the structure of the germ cells, maturation, fertilization, and tracing the modifications of cleavage and gastrulation found in the different classes of vertebrates. Prerequisite, Zoology 3 or 15. Two lectures and one laboratory period per week in Veterinary and Animal Husbandry, two lectures and one to three laboratory periods per week in other courses. Fee, $3.00.

6. **Evolution of Animals.** A discussion of problems and factors of organic evolution, heredity, variation, origin, and distribution of life. Prerequisite, Zoology 3. Lecture, one hour per week.

7. **Comparative Anatomy.** Advanced work on the comparative anatomy of the chief systems of organs of vertebrates, designed especially to give an understanding of mammalian morphology as derived from that of lower vertebrates. Prerequisites, Zoology 3 and 5. Five hours' credit. Three lectures and two laboratory periods per week Fee, $3.00.

8. **Animal Parasites.** Study of the more injurious parasites of domestic animals. Intended especially for Veterinary students. Prerequisite, Zoology 2 or 15. Two lectures and one laboratory period per week in Veterinary Course, two lectures in Animal Husbandry and Science Courses.

10. **Morphology.** Special individual work in continuation of Courses 2, 3, 5, and 7, or 4, 17, and 18, designed especially for those who expect to become teachers and investigators in Zoology, and who are writing their theses in this department. The work will be given a leaning toward general vertebrate or invertebrate morphology, embryology, or taxonomy, depending upon the inclination of the student. Three to five laboratory periods per week. Fee, $3.00.

11. **Neurology.** The comparative morphology of the vertebrate nervous system, especially the physiological anatomy of the human

brain. Prerequisite, Zoology 5. Two lectures and one to three laboratory periods per week. Fee, $3.00.

12. **Human Physiology.** Study of the chief functions of the human body, and the laws of health, preceded by a study of mammalian anatomy, including histology. Prerequisites, Zoology 3 and Chemistry 9. Five hours' credit. Three lectures and two laboratory periods per week. Fee, $3.00.

13. **Human Physiology.** Continuation of Course 12. Five hours' credit. Three lectures and two laboratory periods. Fee, $3.00.

14. **Advanced Invertebrate Zoology.** Study of the structure and development of representatives of invertebrate groups not fully discussed in previous courses; the embryology and anatomy of Echinodermata, the development of a marine worm, the types of Mollusca, Arachnida, and Ascidia. Special attention is paid to modes of respiration, kinds of respiratory apparatus, and also to special sense organs in Pecten, Loligo, etc. Prerequisite, Zoology 5. Two lectures and one laboratory period per week. Fee, $3.00.

15. **General and Vertebrate Zoology.** A study of the anatomy of the grasshopper gives a knowledge of zoological laboratory methods as well as the general structure of insects; a study of the anatomy of the shark serves as an introduction to methods of gross dissection, and of the general morphology of vertebrates. Other vertebrate types, especially the necturus, are studied. The lectures include general animal physiology, and an outline of the comparative anatomy of some of the chief organs of the vertebrates and of elementary vertebrate embryology. Five hours' credit. Lectures, three hours, and laboratory, two periods, per week. Fee, $3.00.

16. **General Zoology.** Intended particularly for students in Horticulture and Agronomy. This course is intended to serve as an introduction both to general animal morphology and physiology, and to the more special work in Entomology required of students in the above courses. The study of the grasshopper in the laboratory, followed by that of a fish, usually the shark, serves as a foundation for the lecture work on the general principles of Zoology, including physiology and development. Five hours' credit. Lectures, three hours, and laboratory work, six hours, per week. Fee, $3.00.

17. **Economic Entomology.** Intended particularly for students in Horticulture and Agronomy. A detailed study in field, insectary, and laboratory of the chief economic species of insects found in Iowa, accompanied by a study of the literature relating to the other more important American species. This course forms the first part of a study of the life histories of our common species of insects which it is necessary to begin in the spring, and which cannot be completed until autumn. It must, therefore, be followed by Course 18 in the succeeding autumn. Credit towards graduation is not given for either of these

two courses separately. Prerequisite, Zoology 4. Three hours' credit. Two lectures and three hours laboratory work. Fee, $3.00.

18. Economic Entomology. This course is described above under 17. Two hours' credit. Six hours' laboratory work. Fee, $3.00.

SPECIAL COURSES.

In addition to the above, special courses will be offered to students intending to write a thesis in Zoology, and also to graduate students in continuation of the work pursued as undergraduates. Special facilities will be offered for such research work. No one will be permitted to write a thesis in this department who has not completed by the end of the Junior year, work in the line in which he wishes to carry on his thesis investigation, at least up to or including Courses 7, or 3, 17 and 18, or 12 and 13, or 14.

DEPARTMENT OF GEOLOGY.

SAMUEL WALKER BEYER, PROFESSOR.
IRA A. WILLIAMS, ASSOCIATE PROFESSOR.

The work of this department is conducted by means of recitations, lectures, conferences, laboratory work, and field excursions. The student is thus afforded an opportunity not only to gain a familiarity with the principles and theories discussed in the leading text-books, but is also encouraged to test these theories and verify the principles discussed in the class room. Field excursions, with carefully written reports are required in all the courses in Geology.

The department of Geology together with the department of Mining Engineering occupies quarters in Engineering Hall. The working equipment consists of museum materials, field and laboratory instruments.

The museum contains carefully selected series of fossils, minerals, rocks and ores, all available for study purposes. Among the more important collections are the educational series of rocks collected by the United States Geological Survey; the Smithsonian collection of rocks and minerals; the Rohn, Hodson and Young collections of rocks and ores from the Lake Superior region; the English mineral collection, containing two hundred specimens and one hundred and fifty species; the Baltimore series of more than two hundred specimens of rocks and minerals typical of the petographic province of Baltimore; the Cushing collection from Clinton County, New York; and a considerable amount of material to illustrate the physical features of rocks and minerals.

In paleontology, the Calvin collection of paleozoic fossils; a large collection of Coastal Plain fossils, principally from the Cretaceous of New Jersey, the Eocene of Alabama and Maryland, and the Miocene of

Maryland and Virginia; the Permo-Carboniferous series from Kansas and Russia; and the coal plants of Iowa, Illinois and Pennsylvania are the most important.

In applied Geology the department possesses comprehensive series of lead and zinc ores with their characteristic gangue minerals from Joplin, Missouri, and from the Iowa-Wisconsin area; copper and iron from the Lake Superior region and from the celebrated localities in the Ural mountains; copper, manganese and silver from Butte, Montana; lead, silver and gold from Colorado, Nevada and California.

Aside from the collections enumerated, Dr. H. Foster Bain, formerly of the Iowa Geological Survey, has kindly loaned to the department his extensive private collection of rocks and minerals; and the Le Grand Quarry Company generously donated a splendid series of building blocks from their quarries which exhibit the various styles of stone dressing.

The laboratory is supplied with four Bausch and Lomb petrographical microscopes; one Fuess, medium model, latest pattern petrographical microscope. All of the instruments are well supplied with accessories; one Ward mineral dresser, one hand goniometer; one set Preston's celluloid crystal models; one set Krantz selected wood models, exhibiting complicated forms; the Krantz collection of 120 thin sections of the common rock-forming minerals selected and arranged according to Rosenbusch, the collection selected to show the various representative characters of minerals and rocks; one section slicing machine, the complete apparatus for rock separations by heavy solutions; and is supplied with apparatus for doing all kinds of photographic work. A considerable number of instruments for reconnoissance and field work in Geology are owned by the department.

The lecture equipment comprises a Hitchcock's geological map of the United States; one set of Kiepert's physical maps; numerous maps and charts of the United States Geological Survey and of the Mississippi River Commission and an elaborate series of lantern slides and photographs.

COURSES IN GEOLOGY.

All of the courses in Geology save numbers 2, 803 and 6 are designed especially to meet the requirements of students who elect the courses in Mining Engineering and Ceramics. At the same time the courses given will afford a good groundwork for students who expect to teach the subject or make Geology their profession. Course 803 is especially adapted for students in Civil Engineering who have not the time to take the more complete work. Course 6 is offered for those who desire a broad view of world geography and it is hoped to make the course helpful to those who expect to teach History, Politics, Geography or Geology.

2. General Geology continued: Historical and Stratigraphic geology. A continuation of Course 501, and completes the work in general geology. Prerequisites, Geology 501, and one or more semesters work in Zoology and Botany. Four hours per week. Three recitations and lectures, and one class hour devoted to laboratory and field work.

6. Advanced Physiographic Geology. This course is devoted to a study of the evolution of the physical features of the earth, and the leading agencies which influence their developments. Prerequisites, elementary courses in Chemistry and Physics. Four hours per week. Three recitations, and one laboratory or field period per week.

9. Meteorology and Climatology. The object of the course is to give the student a knowledge of the fundamental principles which govern weather and climate. The first half of the term is devoted to a study of the elementary principles of meteorology. The student is acquainted with the instruments used by the weather bureau, the principles upon which they are based, and their care and uses are explained. The last half of the term is given to a consideration of the fundamental principles which control weather and climate. Throughout the entire course the charts and maps issued by the state and federal weather bureaus are used freely. The student is given practice on the construction and interpretation of charts and in forecasting. Two hours' credit.

10. The work includes a careful consideration of the principles of dynamic and structural geology, with especial reference to the origin of soils and the surface features. Text-book, "Norton's Elements of Geology." Four hours' credit.

501. General Geology: Dynamic, Structural and Physiographic Geology. The course includes a study of the principles which form the groundwork of the Science and is given by means of recitations, lectures, laboratory, and field work. Prerequisites, one or more semesters each of Chemistry and Physics. Text-book, Scott's Introduction to Geology, 2d Edition. Four hours' credit, three of which are devoted to recitations and lectures, and one to laboratory and field work.

607. Mineralogy. The first half of the term is devoted to a study of the morphological and physical characters of crystalline substances, while the last half is devoted to descriptive and determinative mineralogy. Prerequisites, elementary courses in Mathematics, Chemistry and Physics. Four hours' credit. Four two-hour sessions.

704. Advanced Geology. Petrologic and Advanced Structural Geology. The first ten weeks of the term are devoted to a study of rocks, their origin, occurrence and association, and the last six weeks to a discussion of principles and problems in Structural geology. Prerequisites, Geology 501 and 803. Four hours' credit. Three hours' class work, and one laboratory or field period per week.

803. Engineering Geology. The course includes a discussion of the fundamental principles of dynamic and structural geology and a study of the common minerals and rocks, especially those important in structural materials. Prerequisites, Elementary Chemistry, Mechanics and Heat. Text-book, Scott's Introduction to Geology, 2d Edition. Three hours' credit. Recitations and laboratory work.

805. Economic Geology. The first ten weeks includes a study of the non-metallics while the remainder of the term is devoted to a study of the ore deposits of the United States, Canada and Mexico. Especial stress is put upon the principles which govern the mode of occurrence, association and origin of the leading economic products. Prerequisites, Geology 501 or 803, and 704. Four hours' credit. Consists of three recitations and one laboratory or field period per week.

808. Thesis. Students in Mining Engineering electing to write a thesis in geology are required to take five hours' special work in geology during the eighth semester. This special work may be along any one of the following lines: Economic Geology, Petrology, Dynamic Geology, Structural Geology, Metamorphism, Historical Geology or Stratigraphic Geology.

DEPARTMENT OF ECONOMICS AND POLITICAL SCIENCE.

BENJAMIN HORACE HIBBARD, PROFESSOR.
JOHN EDWIN BRINDLEY, ASSISTANT PROFESSOR.
FRANCIS WILBER DICKEY, INSTRUCTOR.

Economic Science has become a well recognized part of almost all scientific and technical education, because it has made itself useful in investigating and interpreting the material phenomena and facts of everyday life; inductive methods are given first place, deduction being used with caution.

It is the purpose of the department to develop courses of special value to the technical departments of the college. Agricultural and engineering economics are receiving primary attention, and it is believed that the work done in these classes will be helpful in meeting the growing economic problems of the state.

1. Outlines of Economics. In this course a text is followed, and additional work supplied by lectures. Five hours' credit.

3. Economic Problems. Study of socialism, monopolies and trusts. Text-book, Spargo's "Socialism." Prerequisite, Course 1 or 9 Three hours' credit.

4. Money and Banking. Text-book, White's "Money and Banking," supplemented by reading, reports and lectures. Prerequisite, Course 1 or 9. Two hours' credit.

5. Finance. Text-book, Adams' "Science of Finance." Prerequisite, Course 1 or 9. Three hours' credit.

6. Industrial History of the United States. Lectures and class reports. Prerequisite, Course 1 or 9. Two hours' credit.

7. American Labor. A study of labor questions by class reports and lectures. Prerequisite, Course 1 or 9. Two hours' credit.

9. Outlines of Economics. Text and lectures. Three hours' credit.

10. Agricultural Economics. This course consists of lectures and class reports. The topics discussed include historical and comparative agricultural systems; land tenure; size of farms; cooperation; taxation; prices; transportation; marketing; land credit; the relation of the state to agriculture. Prerequisite, 1 or 9. Three hours' credit.

11. State and Local Taxation. This is primarily a research course, the work being conducted in the form of lectures and class reports. Special attention is given to taxation in Iowa. Prerequisite, Course 5. Two hours' credit.

12. Engineering Economics. The economic side of transportation will be given a prominent place. The industrial aspects of irrigation, improvement of inland waterways, municipal utilities, etc., will be studied. An earnest effort will be made to shape this course so as to meet the special needs of engineers. Prerequisite, Course 1 or 9. Three hours' credit.

13. Seminar. Elective for students who have had not less than two previous courses. The purpose of this course is to awaken interest in the general field of economics by following the current events and reading economic magazines. A sketch of economic thought is presented in lectures. One hour credit.

14. Outlines of Economics. Two hours' credit.

16. Principles of American Government. A rapid survey of American governmental institutions, local, state and national. The course will be especially adapted to students who desire to gain in one semester a knowledge of the forms and general principles of the government under which they live. Text book, lectures and assigned readings. Three hours per week.

17. Municipal Government. A comparative study of city governments in England, France, Germany, and the United States, especial attention being given to the problems of municipal government in the United States. Lectures, assigned readings and special reports. Prerequisite, 16. Two hours' credit.

18. Comparative Government. A comparative study of the governments of the United States, Great Britain, France, Germany, Italy, and Switzerland. Lectures, assigned readings and special reports. Two hours per week. Prerequisite, 16.

19. Transportation. A study will be made of railways. telephones, telegraphs, street railways, and other similar corporations with special emphasis on their business organization and their relations to the public. Two hours' credit.

20. Elementary Principles of Law and Business. Designed to make the student familiar with the ordinary legal and business operations. Adapted especially to those who expect to follow agriculture or business as a vocation. The following subjects will be treated: Contracts, negotiable instruments, sales, and personal property. The laws of Iowa relating to highways, fences, water rights, ditching, drainage, live stock, trespassing, etc. Lectures, one hour per week.

21. Economic Geography. A study will be made of production, agricultural and manufacturing, as influenced by nature; that is to say, by climate, soil, mineral, and forest resources; next by social considerations; finally by economic factors such as machinery, transportation, and facilities of exchange. Two hours' credit.

22. Research. Students desiring to do research work in Economics may do so to the extent of three credits per semester during the senior year.

DEPARTMENT OF BACTERIOLOGY.

ROBERT EARLE BUCHANAN, PROFESSOR.
IRA G. MC BETH, ASSISTANT PROFESSOR, SOIL BACTERIOLOGY.
JOHN HAROLD GORDON, ASSISTANT PROFESSOR, DAIRY BACTERIOLOGY.
CHARLES MURRAY, INSTRUCTOR, GENERAL BACTERIOLOGY.
ROY TRUAX, STUDENT ASSISTANT, GENERAL BACTERIOLOGY.

The laboratories for general, sanitary, veterinary, and domestic science bacteriology occupy seven rooms on the third floor of Central Hall and one room on the attic floor. The general student laboratories are fitted with glass-topped tables, water and gas, wall and desk lockers, hoods, thermostats, microscopes, and microscope lockers. These laboratories will accommodate thirty-six students at one time, but by use of a double set of lockers, seventy-five may be accommodated. A separate room is used for the preparation and sterilization of all media. This is equipped with soap stone tables, gas and water, hoods, autoclaves, inspissator, Arnold steam sterilizer, hot air ovens, stoves, etc. A research laboratory, culture room, dispensary, and animal room are also provided. Two lecture rooms used jointly with the Department of Botany are equipped with a very complete outfit for lantern demonstrations and for the projection of microscopic slides. The laboratory also has a set of sixty-five bacteriological wall charts published by the Pasteur Institute.

The laboratories in soil bacteriology are housed with the Department of Soils on the first floor of Agricultural Hall. Student laboratories, accommodating thirty-six students, with laboratory furniture and apparatus, a dispensing room, and a room for thermostats and for storage purposes are provided. The research laboratory is well fitted for graduate work. The greenhouses of the Department of Agronomy, the experimental plats of the Experiment Station, and the soil research and analytic laboratories are all available for the advanced student. Exceptional opportunity is here offered for research work in Soil Bacteriology to those who are qualified to undertake it.

The laboratories in Dairy Bacteriology are situated on the third floor of the Dairy Building. They consist of a student laboratory accommodating thirty-two students, a preparation room, store room, and large research or station room. Each of the laboratories has four constant temperature rooms connected with a refrigeration plant and supplied with gas. The laboratory furniture and equipment is quite complete. There is here, also, an excellent opportunity for research work by the graduate student.

It is anticipated that additional laboratories and facilities for work in Veterinary Bacteriology will be offered upon the completion of the new Veterinary Building.

The courses offered in Bacteriology are grouped under four heads:

Courses in General and Sanitary Bacteriology.
Courses in Veterinary and Pathogenic Bacteriology.
Courses in Soil Bacteriology.
Courses in Dairy Bacteriology.

COURSES IN GENERAL AND SANITARY BACTERIOLOGY.

1. **General Bacteriology.** Lectures are given on the morphology, classification, physiology, and cultivation of bacteria, relation of bacteria to health of man and animals, infection, contagion, immunity, relation to other scientific and agricultural problems. Laboratory work consists of methods of cultivating bacteria and the study of bacterial functions and activities, the solution of specific problems, such as the bacterial content of air, water, and food, with interpretation of results reached. Four hours' credit. Lecture, two hours, and laboratory, six hours, per week. Fee, $5.00.

2. **General Bacteriology.** This course covers in a briefer manner the same ground as Bacteriology 1. Special emphasis is laid upon bacteria in their relation to home sanitation and kindred problems. Two hours' credit. Lecture, one hour, and laboratory, three hours, per week. Fee, $4.00.

3. **Fermentations.** A study is made of the bacterial decomposition of food; the causes and methods of preventing the formation of poisonous products; economic fermentations such as wine, beer, vinegar, koumiss; vegetable enzymes, their activities, and products; moulds, bacteria, and yeasts as related to the preservation and fermentation of foods. Two hours' credit. Prerequisite, Bacteriology 1 or 2. Lecture, one hour, and laboratory, three hours, per week. Fee, $3.00.

4. Technical Bacteriology. A study of the morphology, relationships, and cultural characters of the bacteria of water and water supplies including both the non-pathogenic and pathogenic types, and those active in putrefaction and purification; the algae which contaminate water supplies and produce disagreeable odors and tastes, and methods used in their quantitative and qualitative determination. Three hours' credit. Lecture, one hour, and laboratory, six hours, per week. Fee, $5.00.

5. Advanced General Bacteriology. Advanced work in the biology and physiology of bacteria, intended to fit students to do original or special work in experimental, general, or pathological bacteriology. Prerequisite, Bacteriology 1 or 2. Credit, four hours. Lecture and assigned reading, two hours, laboratory, six hours, per week. Fee, $5.00.

7. Advanced Sanitary Bacteriology. Primarily a study of the bacteria of water and specific instances of pollution of water supplies, and of problems that have been solved in the disposal of sewage and other wastes by means of bacteria. Prerequisite, Bacteriology 1, 2 or 4. Three hours' credit. Lecture and assigned reading, one hour, laboratory, six hours, per week. Fee, $5.00.

9. Thesis. Thesis work may be elected in this department and credit given in the Science Courses. The nature of the work to be undertaken should be decided after consultation. Credit, three hours. Assigned reading, one hour, and laboratory, six hours, per week. Fee, $5.00.

COURSES IN VETERINARY AND PATHOGENIC BACTERIOLOGY.

10. **Veterinary Bacteriology.** A study of the morphology, classification, cultivation, and physiological characters of bacteria; the principles of infection and contagion and a discussion of the various theories of immunity as related to bacterial infection. Two and two-thirds hours' credit. Lecture, two hours, and laboratory, two hours, per week. Fee, $4.00.

11. Veterinary Bacteriology. A continuation of Bacteriology 10 The semester's work is given over largely to a study of the pathogenic micro-organisms, particularly those infecting domestic animals. In the class and laboratory, their cultural characters and theories of immunization will be considered. Some laboratory work will also be given on the preparation of anti-sera and determination of opsonic index, etc. Prerequisite, Bacteriology 10. One and two-thirds hours' credit. Lecture, one hour, and laboratory, two hours, per week. Fee, $3.00.

12. Bacteriology of the Pathogenes. Similar to Bacteriology 10, the extended time permitting the study of bacteria pathogenic to man as well as animals. Prerequisite, Bacteriology 1, 2, 4, or 10. Four hours' credit. Lecture and assigned reading, two hours, and laboratory, six hours, per week. Fee, $5.00.

COURSES IN SOIL BACTERIOLOGY.

Soils 8. Soil Bacteriology. A study of those organisms of importance in the soil, including those which bring about decomposition of nitrogenous and carbonaceous material, nitrification, denitrification, assimilation of atmospheric nitrogen, decomposition of rocks, minerals, etc. The course is intended to cover the interrelationships existing between bacteria and the soil, and thus indirectly between bacteria and the growth of the higher plants. Prerequisites, Chemistry and Bacteriology 1. Three hours' credit. Lecture, one hour, and laboratory, six hours, per week. Fee, $4.00.

Soils 14. Advanced Soil Bacteriology. A continuation of the work given in Soils 8. Prerequisite, Soils 8. Three hours' credit. Lecture and reports on assigned reading, one hour, and laboratory, six hours, per week. Fee, $4.00.

DAIRY BACTERIOLOGY.

Dairy 6. Dairy Bacteriology. An elementary discussion of bacteria and their relation to the care of milk and to the production of butter and cheese. One hour credit. One lecture or equivalent in laboratory work per week.

Dairy 17. Dairy Bacteriology. A study of bacteria in milk and its products; their sources, mode of entry and subsequent changes produced; the production and handling of milk from a hygienic and economic view point and its relation to the public health. Prerequisites, General Bacteriology and Chemistry 26. Four hours' credit. Lectures, two hours, and laboratory, six hours, per week. Fee, $4.00.

Dairy 25. Advanced Dairy Bacteriology. Laboratory investigation of bacteriological problems relating to dairying; the nature of the work being adapted largely to the individual student. Prerequisite, Dairy 17. Credit, three hours.

DEPARTMENT OF DOMESTIC ECONOMY.

(MRS.) ALICE DYNES FEULING, PROFESSOR.

LULU GRAVES, ASSISTANT PROFESSOR.

LELIA PURDY, ASSISTANT PROFESSOR, DOMESTIC ART.

MABEL CAMPBELL, INSTRUCTOR.

ETHEL MAC DONALD, STUDENT ASSISTANT.

EDITH GRAINGER CHARLTON AND NEALE S. KNOWLES, EXTENSION WORK.

The widespread interest in Domestic Economy springs largely from the increasing attention accorded to all social problems. The importance of the home as a social factor is paramount; and the application of science and of the scientific method to household management is coming to be regarded as a necessity. It is not surprising therefore that the study of the home, its functions, its administration, its sanitary conditions, the preparation of foods, and a score of kindred topics should find place in the courses of instruction in colleges and universities. The study of Domestic Economy is profitable not only because of its practical worth, but because of its educative value Many sciences find direct application in the operations of housekeeping; it is consequently the aim of this department to present this home study in such a way as to apply the knowledge gained in related and associated sciences. This study seeks at every point the health, convenience and comfort of the members of the household, and by its utility to add to the value of the well-kept home.

The methods of instruction embrace the lecture system, text-book study, laboratory practice, demonstration lessons, class discussions, presentation of topics on assigned subjects by individual members of the class, and expeditions for observation and criticism. By a judicious combining of theory and practice, science and art, the student gains a thorough understanding of the underlying principles of Domestic Economy and at the same time acquires skill and deftness in execution. Upon completing a systematic course in this department a young woman is prepared to conduct her home successfully and with that ease which comes only through knowledge and experience.

The work of the Domestic Economy department is that of applying the principles of the related sciences, Botany, Zoology, Chemistry, Physiology and Physics to the everyday problems of the home. It does not constitute a special and separate course of study, but is one of the several lines included in the general College courses offered to women students and subject to the usual regulations concerning entrance requirements, classifications, examinations, and class records.

Students are advised not to enter in the second semester for the purpose of taking beginning work in Domestic Economy, for there are no beginning classes at that time. The work of the second semester is a continuation of the work of the first semester.

Domestic Economy 8, 22, 23, 35, 36, 37 and 38 give science credit in Junior or Senior years in General Science course.

A course in Domestic Economy is offered during the winter vacation for the benefit of the women of the state who are unable to take a college course. Lessons, including actual laboratory work, in sewing, cooking and chemistry of foods are offered. Lectures are given in home nursing, home decoration and artistic dress. There are no prerequisites for this course. Fee, $3.00.

This department employs two extension workers who teach Domestic Economy throughout the state under the direction of the Agricultural Extension Department.

COURSES IN DOMESTIC ECONOMY.

Domestic Science.

8. **Laundry Work.** Study of soaps, washing fluids, bleaching powders, bluings and starches; their scientific and practical relation to laundry work, also actual work in the laundry. Prerequisite, Chemistry 24. One hour credit. Laboratory, one period per week. Fee, $3.00.

9. **Theory and Practice of Teaching Domestic Science.** Treats of the purpose of Domestic Science in education, its relation to other subjects in the curriculum, methods of presentation, planning courses of study. Plans for furnishing and equipping laboratories in the various classes of schools and cost of same. The laboratory work consists of teaching public school classes. Prerequisite, D. E. 35. Two hours' credit. Recitation, one hour, and laboratory, one period, per week. Fee, $3.00.

10. **Theory and Practice of Teaching Domestic Science.** Continuation of D. E. 9. Two hours' credit. Recitation, one hour, and laboratory, one period, per week. Fee, $3.00.

22. **Sickroom Cookery and Home Nursing.** A course of lectures including the furnishing, warming, and ventilating the sick room; bathing, dressing and administering food and medicine to patients; practical bandaging and bed making, lifting and caring for helpless patients; preparation and application of bandages, and the preparation of nourishing, palatable, and digestible dishes. Prerequisite, D. E. 36. One hour credit. Laboratory, one period per week. Fee, $3.00.

23. **Home Management.** Includes care of dining room and pantry, cut glass, silver and cutlery; planning, buying, preparation and serving of breakfast, luncheon and dinners; food as an economical factor, the administration of the home. Prerequisite, D. E. 36. One hour credit. Laboratory, one period per week. Fee, $5.00.

27. **Household Accounts.** One laboratory period. One hour credit.

30. **Seminar.** History of Domestic Economy movement and its effect upon education; the Domestic Economy work in other colleges and institutions of learning; its function in charity organizations, church work, Y. W. C. A., and public schools; special problems for investigation are assigned. One hour credit. Recitation, one period per week.

35. **Food and Dietetics.** A study of the food principles, carbohydrates, proteids, fats and mineral matter; their chemical composition, digestibility, nutritive value and cost; the effects of cooking and the best methods of preparing and serving foods from a sanitary and dietetic standpoint; making standard dietaries appropriate to various conditions of occupation, climate, age, and sex with limited cost; a study of foods suitable for old people and for children; the ethics of

the dining room. The laboratory work includes a complete course in practical scientific cooking and serving of foods. This course aims to train students in the proper care and use of kitchen and dining room with their utensils and equipment. Emphasis is placed upon system, accuracy, neatness and skill. Prerequisite, Zoology 12. Five hours' credit. Recitations, three hours, and laboratory, two periods, per week. Fee, $7.00.

36. **Food and Dietetics.** Prerequisite, D. E. 35. Five hours' credit. Recitations, two hours, and laboratory, three periods, per week Fee, $10.00.

37. **Home Sanitation.** Study of location and surroundings of the house, its plan, furnishing, and care, from the sanitary standpoint, including drainage, disposal of household waste, heating, lighting, ventilating and water supply. Prerequisite, Bacteriology 2. Two hours' credit. Recitation, two hours per week.

38. **Geography of Foods.** A study of production, transportation, preparation, adulteration and consumption of foods, also their market value as compared with food value. Prerequisite, D. E. 36. Two hours' credit. Recitation, two hours per week.

Domestic Art.

1. **Clothing.** This course is designed to give knowledge of the various uses of hand and machine sewing, the use of patterns, the accurate taking of measurements, economical cutting of material, the making of garments. A study is made of the various fibres, the development of spinning and weaving, modern processes of manufacture, comparison of fabrics, economic values. Two hours' credit. Recitation, one hour, and laboratory, one period, per week. Fee, $1.00.

4. **Clothing.** Continuation of D. E. 1. Two hours' credit. Recitation, one hour, and laboratory, one period, per week. Fee, $1.00.

6. **Costume.** In this course each student makes an unlined cloth shirt waist suit. Lectures deal with the history of costume in its relation to modern dress, healthful and appropriate clothing, the work of the Consumer's League. Prerequisite, D. E. 4. Two hours' credit. Recitation, one hour, and laboratory, one period, per week. Fee, $1.00.

7. **Costume.** Each student makes a light summer dress and thin white shirt waist. Topics for discussion: Art principles applied to costumes, color in its relation to dress, the effect of different textiles, artistic dress. Prerequisite, D. E. 6. Two hours' credit. Recitation, one hour, and laboratory, one period per week. Fee, $1.00.

11. **History of Art.** Architecture and Sculpture. The organic and typical forms of architecture are studied with relation to their origin, character and development, and their particular adaptation to the existing conditions as to building materials and the needs and ideals of men. Sculpture is studied for its own perfection of beauty

and grace and its use as an adjunct of architecture. Two hours' credit. Recitations, two hours per week.

12. **History of Art.** Continuation of D. E. 11 with Painting as principal subject. Two hours' credit. Recitations, two hours per week.

13. **Home Decoration.** The principles of construction, ornamentation and color harmony are applied to furnishings and utensils and to the treatment of walls, floors and ceilings, by means of lectures and specimens of textiles, wall papers, pottery, fine glass and silver. Prerequisite, D. E. 37. One hour credit. Recitation, one hour per week.

14. **Theory and Practice of Teaching Domestic Art.** This course considers the place of domestic art in education, its relation to the curriculum, problems of subject matter and of method, development of lesson plans. Practical work consists of assistance and teaching in public school classes. Prerequisite, D. E. 7. Two hours' credit. Recitation, one hour, and laboratory, one period, per week. Fee, $3.00.

32. **Theory and Practice of Teaching Domestic Art.** Continuation of D. E. 14. Includes planning of courses for various schools, the problems of planning, furnishing, and equipping departments, relation to cost, the collection and use of illustrative materials. Prerequisite, D. E. 14. Two hours' credit. Recitation, one hour, and laboratory, one period, per week. Fee, $3.00.

39. **Practical Cooking.** A laboratory course in practical cooking and the serving of foods, in which emphasis is placed upon the sanitary and economic phases of the subject. No prerequisite. No credit. One laboratory per week. Fee, $5.00.

40. **Practical Cooking.** Prerequisite, Domestic Economy 39. No credit. One laboratory per week. Fee, $5.00.

41. **Personal Sanitation and Hygiene.** A lecture course intended to help the student to care for her person, clothing and surroundings in a sanitary manner. No prerequisite. No credit. One lecture per week.

DEPARTMENT OF LITERATURE AND RHETORIC.

ALVIN BUELL NOBLE, PROFESSOR.
*ELIZABETH MAC LEAN, ASSOCIATE PROFESSOR.
ELIZABETH MOORE, DORA GILBERT TOMPKINS, *JULIA RAMSEY VAULX,
WILLIAM RANDOLPH RAYMOND, ASSISTANT PROFESSORS.
MARY MAKEPEACE MORRIS, RUTH BOGARDUS SAFFORD, ESTHER LEIPER COOPER,
GEORGE MAC MINN, JESSIE MILDRED MAC LEAN, HEARTY EARL BROWN,
INSTRUCTORS.
EDNA EVERETT, MARGARET MC ELROY, STUDENT ASSISTANTS.

In the courses in English two ends are sought, utility and culture. Utility predominates in the first years and culture in the last, though there is hardly a recitation but contains something of both.

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*On leave of absence for the spring semester.

So long as man communicates his thoughts and feelings to his fellows, so long will language have a practical value. The man who speaks in a bungling manner, only half succeeds in communicating his thoughts to others. If they catch his real meaning they do it by a happy inference of their own as to what he meant to say. But no man can afford—certainly no college man can afford—to depend on others to correct his own faulty speech. If he uses the wrong word, arranges the parts of the sentence improperly, gives some part an undue emphasis, or fails to indicate clearly the bearing of one sentence upon another, his language does not truly present his thought, and the world may profit little from his attempt to state it. The more valuable his thought, the greater his need for a clear and effective use of language.

If the student has mastered grammar and rhetoric, that is, if he has been trained to *apply* the principles gone over, his speech should be free from errors and inaccuracies of expression. More than this; if he has been directed by his study to good models, if he has been taught not merely to correct what is faulty, but also—and this is far more important—to appreciate what is excellent in diction, in sentence structure, in the development of paragraphs and of whole compositions,—if he has been made to feel the increased utility, the beauty, and the power of language as used by the masters of expression, he will not be content to use language that has only the negative merit of being without faults, but will press on to attain a style enriched by the presence of real excellence, a positive quality. Such language is not simply clear and accurate, it is pleasing and powerful, and the man who has acquired such skill in the use of language has greatly increased his influence in the world. If he can give his valuable thought an adequate expression, his fellows will learn the thought from him, and give him honor accordingly; if he cannot, they will learn it from one who can state it more clearly or more attractively, and the reward is quite as likely to go to the man who best states the thought as to the one who first discovers it.

The courses in grammar, rhetoric, and composition are devoted primarily to this utilitarian end. The facts and principles of language are studied, not as valuable in themselves, but as useful when applied in spoken or written discourse. To this end the student is required to write much, always with some definite object to be accomplished, and usually with some good model before him to inspire him to more earnest effort. When once he has learned to draw from his reading suggestions that will be helpful in his future compositions, he has found a possible utility in everything he studies as literature, and has opened the door to continual improvement. Moreover, in learning to appreciate what is best in the models set before him, he gains insensibly something of culture as well as utility.

In the courses in Literature it is probably true that the culture side predominates, yet utility is seldom lacking. The study of Literature calls for close observation, correct inference, fine discrimination. When the mind is trained to do such work, it acquires a power that abides, a power that can be applied to any task. Literature deals with the whole range of human experience, emotion, activity. In studying Literature, therefore, we are required to give some study to the mind and heart of man. If such study does not exert an elevating influence, it can only be because the reader does not choose the best, or does not approach the work in the right spirit. At the very least it ought to give him a deeper insight into human nature, and that is no small gain. But Literature is also an art, an art that engages the attention of more people, and holds that attention for a longer time than does any other art. In studying it, therefore, we are cultivating the aesthetic sense, a part of our nature not appealed to by most studies. Best of all, perhaps, it brings us into the company of the rarest minds of all times; it gives command of the best thought of the best minds; it brings to us the "blessed companionship of wise thoughts and right feelings." It broadens the mind, quickens the imagination, enlarges the sympathies, enriches the whole nature.

COURSES IN ENGLISH.

10. Narration and Description. A study of good models in these two forms of discourse, with lectures on the principles to be observed and the methods to be employed; careful attention to making plans and outlines; an essay once a week, with an exercise almost daily, with constant emphasis on the ability of the student to apply in his own composition the principles studied. Prerequisite, diploma from a fully accredited high school, or an entrance examination. The first ten days will be given up to a rapid review of grammar, and essays on simple themes. Three hours' credit. Fee, $.75.

11. Exposition. Study and practice in expository writing, following the same general method as in Course 10. Prerequisite, Course 10. Three hours' credit. Fee, $.75.

12. Argumentation. A study of the principles of argumentation, with analysis of good models. Practice in making briefs and in writing forensics. Prerequisite, English 11. Two hours' credit. Fee, $.50.

13. Advanced Composition. A course in composition in any of the forms of discourse, each student writing along the line of his own needs and interests. In part daily themes and in part longer papers based on literary reading and original research. Two hours' credit.

COLLEGE COURSES IN LITERATURE.

1. English Drama. Devoted mainly to a study of Shakespeare, with a rapid survey, largely by reports and informal lectures, of the English Drama before his time, and a rapid reading of a few dramas of subsequent time. In Shakespeare three or more plays will be studied carefully and others read rapidly. Character analysis and interpretation, with grouping and contrast. Plot analysis, with stages of complication and resolution. Prerequisite, English 11. Three hours' credit.

2. **Epic and Lyric Poetry.** A course in English poetry, excluding the drama. Principal attention given to Milton, Wordsworth, Tennyson, and Browning, with minor attention to Dryden, Pope, Burns, Coleridge, Shelley, and Keats. Classification of the various forms of poetry. Study of rhythm, meter, rhyme, alliteration, figures of speech, melody, harmony, etc. Principles of criticism applicable to the poems studied. Prerequisites, English 10 and 11. Literature 1 or 5, though not strictly necessary, will be of great help. This course may be divided into two parts, as Literature 10 and Literature 11. Five hours' credit.

3. **Novel and Romance.** A course in the novel and romance from the eighteenth century to the present time; differences between the two forms; comparison with the drama; plot and character analysis; an outline for systematic study. Prerequisites, same as in Literature 2; Literature 6 will also be of help. Three hours' credit.

4. **American Literature.** A study of our best poets and essayists; comparison with English authors and works; interrelations of our literature and history; includes the prominent writers of the present day. Prerequisites, English 10 and 11; Literature 2 will be of help. Three hours' credit.

5. **Drama.** Combination of Courses 1 and 8. Prerequisites, English 10 and 11. Five hours' credit.

6. **The Short Story.** A study of the short story from the time of its development as a distinct literary form to the present time; the various types and classes of the short story, with principal attention to the product of the last fifty years in France, England, and the United States. Prerequisites, English 10 and 11; Literature 1 or 5 is strongly urged as a preparation for this course. Two hours' credit.

7. **The Essay.** The leading English essayists, as Addison, Steele, De Quincey, Macaulay, Carlyle, Ruskin, and Matthew Arnold. Prerequisites, English 10 and 11. Two hours' credit.

8. **The Drama in Translation.** A study of the leading Greek, French, and German dramas through an English translation. May be taken as a part of Course 5 or independently. Prerequisite, English 11. Two hours' credit.

10. **Epic and Lyric Poetry, 19th Century.** Chief attention given to Wordsworth, Tennyson, and Browning, with a more rapid study of Coleridge, Keats, Shelley, and some of the later English Poets. A part of Course 2, but may be taken independently. Prerequisites, English 10 and 11. Three hours' credit.

11. **Epic and Lyric Poetry, 16th, 17th, and 18th Centuries.** Chief attention given to Milton, with more rapid study of Dryden, Pope,

Burns, and other minor writers. A part of Course 2, but may be taken independently. Two hours' credit.

13. Literature. A short course including, so far as time permits, a survey of the principal forms of literature, limited of course, to the masters in each field. In the fall semester emphasis will be placed upon the Short Story and the Novel. Aim, to distinguish between what is and what is not excellent, by fixing in mind the qualities that contribute to greatness in these forms of literature. Method, rapid reading with attention directed to a few qualities, rather than minute detailed study. To give a broader outlook the reading done by the student will be supplemented by reports and lectures. Two hours' credit.

14. Literature. A continuation of Course 13, with emphasis on the Essay, the Drama, and Lyric Poetry. All work will be assigned with a view to appreciation through rapid reading, rather than by minute study. In the Drama will be included one or more plays from Shakespeare and also from present day dramatists. In the Essay, selections from such masters as Ruskin, Emerson, and Carlyle. In Lyric Poetry, selections from the most prominent poets of the 19th century. Two hours' credit.

15. General Course. Study of the leading authors in chronological order with enough of the history of literature and the life of the author to give background. The main purpose is to fix standards for determining what is and what is not good, and to develop the power of interpreting literature and an appreciation of the best literature. Fall semester. Three hours' credit.

16. A continuation of Course 15. Spring semester. Three hours' credit.

DEPARTMENT OF PSYCHOLOGY.

ORANGE HOWARD CESSNA, PROFESSOR.

NOTE—The following courses in the department of History and Psychology will count toward the state teacher's certificates:
Psychology 7 and 8, 5 and 6, **and 9.**
History 20 and 21.

2. Ethics. This course covers both theoretic and practical ethics and is based on standard texts such as Mac Kenzie's, Muirhead's, and Dewey and Tuft's Manuals. The texts are supplemented by lectures and library work. Three hours per week.

3. Advanced Psychology. This course is a study of the popular mind and treats of the characteristic feelings, beliefs and actions of men in consequence of their association. Some of the topics treated are as follows: The mind of the crowd, the mob mind, public opinion, mental characteristics of the audience, social psychology, social intelligence and feeling, suggestibility, conventionality, custom, etc. Prerequisite, Psychology 4, or 7 and 8.

4. Essentials in Psychology. This course covers the main facts of psychology, and is based on such texts as Titchner's Primer of Psychology, Betts' The Mind and Its Education, James' Talks to Teachers, Thorndike's The Human Nature Club. It is a briefer course than is required for the state teacher's certificates given in Courses 7 and 8. Text-books, lectures, and class demonstrations. Three hours per week.

5. Psychological Principles of Education. This course treats of the psychological principles of education, including the general laws of the growth of the mind and the educational aspects of various mental phenomena. It is based on such texts as Horne's Psychological Principles of Education, Bagley's The Educative Process, and Thorndike's Principles of Teaching. Text-book, lectures, and assigned work. Three hours per week.

6. Child Psychology. This course treats of the various mental features of child growth. It is a study of the characteristics of childhood, and the significant mental changes of the adolescent period. It is based on such texts as King's The Psychology of Child Development, Kirkpatrick's The Fundamentals of Child Study, and Hall's Adolescence. Text-book, lectures, and assigned work. Three hours per week.

7. Descriptive Psychology. This course treats of the elements and outlines of psychology, and is designed as an introduction to the other courses in psychology and principles of education and child study. Standard texts are used such as those of Angell, James, Titchner, Thorndike, together with Seashore's Elementary Experiments in Psychology, supplemented by lectures, and illustrative experiments before the class. Three hours per week.

8. Descriptive Psychology. (Continued.) This course is a continuation of Course 7 which must precede it. Three hours per week.

9. General Methods of Education. This course is based on such texts as McMurry's Elements of General Method of Education and The Method of the Recitation, and Bagley's The Educative Process. It treats of such topics as the chief aim of education, relative value of studies, interest, correlation, induction, apperception, the will, the individual notion, the general notion as the goal of education. The mental laws underlying the educative process. Two hours per week.

STATE TEACHERS' CERTIFICATES.

In accordance with the law passed by the Thirty-first General Assembly, the State Board of Educational Examiners will grant five-year first-grade state certificates to graduates of the Iowa State College who have completed the following work:

(1) Psychology—Six semester hours.

(2) Education—Fourteen semester hours.

a. Principles and Science of Education. Limited to eight semester hours.

Under this head may be included Child Study, Philosophy of Education, Philosophy of Teaching and Ethics or Psychology of Conduct.

b. History of Education. Limited to eight semester hours.

Under this head History or Philosophy or History of Industrial Education may be offered.

c. General and Special Methods of Teaching. Limited to four semester hours.

Under this head accredited colleges may offer courses in methods of teaching secondary subjects to students who have made majors of these subjects.

This first-grade five-year state certificate may be renewed at the end of five years upon proof of at least three years of successful teaching.

For the courses which will meet the requirements for the state teachers' certificates see notes of explanation in the description of the courses in the department of psychology and the following course in Civics:

12. Secondary Schools, School Management and Administration. Modern tendencies in educational legislation; place of secondary schools, program of studies, discipline, methods applied to secondary instruction, medical inspection of schools, text-books, class room management, etc. Two hours' credit.

DEPARTMENT OF HISTORY.

ORANGE HOWARD CESSNA, PROFESSOR.
LOUIS BERNARD SCHMIDT, ASSISTANT PROFESSOR.
ETHYL CESSNA AND CARRIE C. WATTERS, INSTRUCTORS.

COURSES IN HISTORY.

3. The West in American History to 1850. This course treats of the history of the settlement and development of the west, with special reference to the Mississippi Valley. Emphasis is put on social, economic and political conditions. It deals with the westward movements, the growth of new institutions, the bearing of new problems upon the interpretation of the constitution and economic and social forces in their influence upon the growth of democracy. Text-book, lectures, and research work. Three hours per week.

4. Division and Reunion, 1850 to 1898. Conditions preceding the Civil War, the causes, principal features and results of the struggle; the Reconstruction period; the political, social, and economic movements and foreign relations of America as it faces the problems of the present. Text-book, lectures, and research work. Three hours per week.

5. Europe in the XVIth, XVIIth and XVIIIth Centuries. A study of historical development, the Reformation, struggle for constitutional liberty in England, ascendency of France, rise of Prussia and Russia, England's Colonial supremacy, also social, economic and literary questions. Lectures, and library work. Three hours per week.

6. French Revolution and XIXth Century. Causes and results of the French Revolution, the Napoleonic era, reactions and revolutions of the XIXth Century to the close of the Franco-Prussian war; also institutional changes touching the political, social and economic aspects of the movement. Text-books, lectures and library work. Three hours per week.

7. America in the Far East. This course is a study of some of the later phases of American development, especially as it has come into touch with the Far East. Text-book, lectures, and library work. Two hours per week.

9. Some Later Phases of the Far Eastern Question. This course is a study of some of the later developments in the Far East, dealing especially with the New China and the New Japan since the Russo-Japanese War, showing America's new interest in the Far East. Text-book, lectures, and library work. Two hours per week.

10. The Renaissance. A general survey of the renaissance period followed by a somewhat detailed exposition of economic, political, intellectual and artistic progress with a criticism of the importance attached to the influence of revived antiquity. Includes a history of the movement in Italy and in the northern countries, and a consideration of the agencies and events which ushered in the modern age. Text-book, lectures and assignments. Two hours per week.

11. Constitutional History of England to 1689. Study of origin and development of the English constitution and political institutions, and their influence upon the American political system. Text-book, lectures and library work. Two hours per week.

12. Diplomatic History of the United States. A study of the diplomatic negotiations and treaties between the United States and foreign powers. Special attention will be given to the formation of the French alliance, treaty of 1783, early commercial treaties, purchase of Louisiana, Treaty of Ghent, acquisition of the Floridas, the Monroe Doctrine, Mexican relations, civil war diplomacy, and Spanish affairs. The progress of international law so far as it has been affected by the United States in these controversies will also be considered. Text-book, lectures and library work. Two hours per week.

17. The American People. This course gives an outline view of the expansion of the American people. Special emphasis is given to the social and territorial features in this development, with special reference to the part played by the people in the making of the American nation. Lectures, text-book and library work. One hour per week.

18. American Statesmen. This course treats of the work of the leading statesmen in the formation and growth of the American nation. The different movements in the political evolution of a nation become embodied in great men. While emphasis is placed on movements rather than on biographical details, yet it is recognized that these movements become vitally expressed in personality. Lectures, text-book and library work. One hour per week.

19. The Making of the Nation, 1760-1829. This course treats of the formation of the American Union. It includes a survey of the Revolutionary period; a study of the critical period; the formation and adoption of the constitution; the inauguration of the new government; early national problems; and the formation of policies and political parties. Lectures, text-book, and library work. Two hours a week.

20. History of Education. This course, after a general survey of the history of education during the earlier periods, gives careful consideration to Hebrew, Greek and Roman education; continuing with a briefer survey of education during the middle ages, it deals more fully with the renaissance and reformation periods, also the realistic movements under Erasmus, Montaigne and Comenius. Monroe's History of Education is used as a text, supplemented by lectures and class reports. Two hours per week.

21. History of Education (Continued). This course is a continuation of History 20, and treats of the disciplinary conception of education under Locke; the naturalistic tendency under Rousseau; the psychological tendency under Pestalozzi, Herbart and Froebel; the scientific tendency of Spencer and Huxley; the later sociological tendency, and closing with a consideration of the present eclectic movements. Monroe's History of Education is used as a text, supplemented by lectures and class reports. Two hours per week.

DEPARTMENT OF PUBLIC SPEAKING.

ARTHUR MAC MURRAY, PROFESSOR.

SYBIL M. LENTNER, ASSISTANT PROFESSOR.

FREDRICA VON TRICE SHATTUCK, INSTRUCTOR.

COURSES IN PUBLIC SPEAKING.

2. The Declamation. This course is planned to help the student get command of himself. Attention is especially given to voice building and bodily expression. Besides this technical work, students are assigned individual selection for practice and each is met for private rehearsal at regular intervals. One hour per week.

3. Interpretation. This is a course in the study of methods of vocal interpretation, methods of criticism and methods of delivery. Of each student is required a repertoire, and beside the class lectures and class exercises on topics pertaining to interpretation, each student is instructed privately and personally at stated intervals throughout the semester. Prerequisite, Course 2 or its equivalent. Two hours per week.

4. **Interpretative Analysis.** Character study, dramatic and analytical interpretation are begun. Methods of analyzing, clipping and arranging stories and other literary forms complete the term's work Students are met for private rehearsals and criticisms as in preceding courses. In this course class and public recitals are expected of the students. Prerequisite, Course 3, or students may be admitted to this course upon the recommendation of the instructor in charge. Two hours' credit.

5. **The Lecture Recital and Monologue.** Option between Courses 5 and 10. This course is especially designed for the study of the Lecture Recital and Monologue. How to select, introduce, and arrange selections for the lecture recital, and the art of preparing and arranging a monologue from a play or work of fiction are the essential purposes of this course. It is presupposed that the student has some dramatic ability. Prerequisite, Course 3. Two hours' credit.

6. **Lecture Recital and Monologue.** Option between 6 and 11. The student is required to prepare and deliver one strong program, either a lecture recital or monologue during the semester. Private rehearsals are given the student in preparation for the program. Prerequisite, Course 5. Two hours' credit.

7. **The Fine Art of Speech.** This is a course for women in the fine art of the spoken word. Though covering much the same ground as Course 10, it is designed particularly to suit the needs of women. The art of speech is compared with other arts; speech forms and values are studied and much time given to extempore speech-making in class. Two hours' credit.

8. **Orations and Orators.** This course is a study of prepared and formal address, such as orations and speeches for special occasions. Historical masterpieces and winning orations are studied, lectures are given on the technical structure of oratorical productions. At least one oration is required of each student during the semester. One hour credit.

9. **Oration.** Optional with Course 10, and open to those who wish to make special preparation to enter oratorical contests. In addition to the special study of the construction and delivery of oratorical productions, one oration will be prepared and delivered by each student. One hour credit.

10. **Extempore Speech.** The purpose of this course is to develop the power of sincere and effective public speaking. The fundamental principles of speech organization and delivery are studied according

to the true extemporaneous method. The assimilation of the essentials of effective speaking and the working out of these essentials into actual practice before the audience is the basis of the work. At least six lectures are given by the head of the department. These are given at regular intervals during the semester. Each student is given the opportunity to appear in an original speech before his fellow students at least once every two weeks. All students are aided in their advancement by the stimulating and helpful criticism of the instructor. Two hours' credit.

11. **Extempore Speech.** Essentially the same methods are used as in Course 10, although the work is of a more advanced nature. Lectures are given by the Head of the Department at regular intervals during the semester, and each student is given the opportunity to appear before the class in a short address every ten days or two weeks. No course is absolutely prerequisite to Course 11, but it is advisable for the student to take Course 10. Two hours' credit.

15. **D. E. Public Speaking.** This course is for women, and is designed to prepare them for Domestic Science demonstration work, and to fit them to appear in public address before women's clubs, institutes, and other organizations where women are called upon to discuss subjects of vital public interest. Practice in the organizing and rendering of speeches, before the student audience, under the helpful criticism of the teacher is the keynote to the work of the course. Two hours' credit.

16. **Advanced Public Speaking.** This course is especially designed for the training of those students who wish to prepare themselves for institute speaking or for other public speaking which should require special training and equipment. This work will be conducted under the special direction of the Head of the Department and will involve the advanced study of those principles of Public Speech the mastery of which will enable the speaker to acquit himself creditably before a public audience. No courses are prerequisite to Course 16, but students entering this course should, if possible, have had Courses 10 and 11. One hour credit.

17. **The Art of Debate.** The object of this course is to furnish a preliminary training class for those who purpose to enter the debating contests, or who desire a general knowledge of debating work. The rules governing debate, the preparation and arrangement of argument, and training in effective delivery will receive especial attention. Prerequisites, English 10 and 11. Also English 12 should be taken as a prerequisite or at the same time with Course 17. One hour credit.

18. **The Art of Debate.** Continuation of Course 17. One hour credit.

DEPARTMENT OF MODERN LANGUAGE.

FLETCHER BRIGGS, PROFESSOR.

GRACE ISABEL NORTON, LOUISE M. PETERS, INGEBORG G. LOMMEN, (MRS.) MARY PETERS FAIRFIELD, (MRS.) MARGARET ALISON ARVILLE, AND MARIE ZIMMERMAN, INSTRUCTORS.

FRENCH.

1. **Elementary French.** Grammar and reading, with practice in writing and speaking French. Special attention is given to pronunciation. Fraser and Squair's French Grammar. Five hours' credit.

2. **Elementary French.** Continuation of grammar, with special attention to irregular verbs; reading, with constant practice in writing and speaking French. Texts used are chosen from La Brete, Scribe, Erckmann-Chatrain. Five hours' credit.

3. **French Prose.** Selected reading from Manpassant, Daudet, Loti, and Anatole France; Bouvet's Prose Composition. Prerequisite, Course 2. Three hours' credit.

4. **French Verse.** Selected French Lyrics and dramas. Prerequisite, Course 3. Three hours' credit.

18. **Scientific French.** Selected reading in physics, chemistry, geology and mineralogy. Texts used, Herdler's Scientific French Reader, and Bowen's Scientific Reader. Prerequisite, Course 2. Three hours' credit.

19. **Scientific French.** Continuation of French 18. Three hours' credit.

51. **French Novel of the 19th Century.** A reading course devoted to the important novels of such authors as Hugo, Balzac, Sand and Daudet. Prerequisite, Course 4. Three hours' credit.

52. **French Novel of the 19th Century.** A continuation of French 51. Three hours' credit.

53. **French Drama.** Selected dramas from the works of Corneille, Racine and Marivaux. Prerequisite, Course 4. Three hours' credit.

54. **French Drama.** A continuation of Course 53. Three hours' credit.

57. **Elementary French.** Three hours' credit.

58. **Elementary French.** Three hours' credit.

(Courses 57 and 58 are open only to those students in the Engineering Division who have offered in Latin the language credits required for admission.)

Cercle Francais. The students of the College have organized the club to cultivate the French language. Programs and informal conversation are enjoyed at the regular meetings.

GERMAN.

5. Elementary German. Grammar and reading, with constant practice in pronunciation and in writing German. Bierwerth's Beginning German, and Spanhoofd's Erstes Lesebuch. Five hours' credit.

6. Elementary German. Continuation of Grammar and reading in Course 5, together with such texts as Storm's Immensee and Gerstäcker's Germelshausen. Five hours' credit.

5a. Intermediate German. Grammar, reading and composition. (Open only to those who have offered one year of German for admission.) Three hours' credit.

6a. Intermediate German. Grammar, reading and composition. Prerequisite, German 5a. Three hours' credit.

7. Selected Dramas. Works of Lessing, Goethe, and Schiller, and German Composition. Prerequisite, Course 6 or 6a. Three hours' credit.

8. Selected Dramas. A continuation of Course 7. Three hours' credit.

16. Scientific German (Agricultural). Selected reading in botany, biology, bacteriology, chemistry and geology. Course 6 or 6a. Three hours' credit.

17. Scientific German (Agricultural). A continuation of Course 16. Three hours' credit.

20. Scientific German (Engineering). Selected reading in physics (such topics as sound, heat, light, and electricity), chemistry, geology, and mineralogy. Texts used, Blochmann's Scientific German, and Wait's German Science Reader. Prerequisite, Course 6 or 6a. Three hours' credit.

21. Scientific German (Engineering). A continuation of Course 20. Three hours' credit.

22. Advanced Scientific German (Engineering). German periodicals in engineering used as texts. Prerequisite, Course 21. Two hours' credit.

23. Advanced Scientific German (Engineering). German periodicals. A continuation of Course 22. Two hours' credit.

24. German Composition and Conversation. Pope's German Composition is the basis of the work. Additional assignment of topics for individual reports in German, review of grammar, and constant use of the language. Students should consult with the instructor before electing the course. Prerequisite, Course 8, 17 or 21. Three hours' credit.

25. German Composition and Conversation. Continuation of Course 24. Three hours' credit.

27. Modern German Novel. Novels selected from the works of

Scheffel, Freytag and Sudermann. Prerequisite, Course 8. Three hours' credit.

28. Modern German Novel. Continuation of Course 27. Three hours' credit.

40. Modern German Poetry. Lyrics and Ballads. The text used is Klenze's Deutsche Gedichte. Prerequisite, Course 8. Two hours' credit.

41. Modern German Poetry. Continuation of Course 40. Two hours' credit.

42. Goethe's Faust. Both parts of the poem are discussed and interpreted, with supplementary lectures on the Faust literature. Prerequisite, Course 28. Two hours' credit.

Certificate in German. A special certificate is offered to those students who show marked ability in certain outlined work. The courses required for this certificate are Language 5, 6, 7, 8, 24, 25, 27, and 28.

Deutscher Verein. This club, consisting mainly of students, aims to promote their common interests in the German people by cultivating an acquaintance with the German language, literature, history and customs.

SPANISH.

30. Elementary Spanish. Grammar, reading, composition, and conversation. Much attention is given to pronunciation. Hill and Ford's Spanish Grammar. Five hours' credit.

31. Elementary Spanish. Continuation of grammar and reading, together with composition. Prerequisite, Course 30. Five hours' credit.

33. Elementary Spanish. (Open only to those students in the Engineering Division who have offered in Latin the language credits required for admission.) Three hours' credit.

34. Elementary Spanish. A continuation of Course 33. Three hours' credit.

36. Scientific Spanish. Reading and review of grammar, together with composition. Some text, such as Balfour Thomas' Nociones de Fisica. Three hours' credit.

37. Spanish Correspondence and Conversation. Harrison's Commercial Correspondence is the basis for this work. Prerequisite, Course 36. Three hours' credit.

Latin-American Club. Students from the Latin countries, together with American students interested in Spanish, have organized this club to further the acquaintance among the various peoples.

DEPARTMENT OF MILITARY SCIENCE AND TACTICS.

GENERAL JAMES RUSH LINCOLN, PROFESSOR.

It is not intended to complete the education of the thorough soldier, but to fit young men for filling intelligently, positions in the State troops as line officers and company instructors. The constant demand for men thus trained emphasizes the value of a thoroughly organized and well sustained military course. The chief advantages derived are the acquirement of a dignified carriage of person, a gentlemanly deportment and a self-respecting discipline, with habits of neatness, order and punctuality. Opportunities are offered each cadet for extending the studies in military science, as desired, the College being provided with the necessary arms, accoutrements and outfits for drill and instructions in the infantry, artillery, and signal tactics, for which special classes will be formed. Lectures on military subjects are delivered throughout the course and regular battalion drill and parade take place each Monday and Wednesday afternoon.

All male students of the Freshman and Sophomore years, except such as may be excused on account of physical disability by proper authority, are required to become members of the College Battalion, and wear the prescribed military uniform during military exercises.

COURSES IN MILITARY SCIENCE AND TACTICS.

1. Two drills per week.

2. Two drills per week.

3. Two drills per week, also the Non-Commissioned Officers' School of one hour per week, the School of the Guides and Guard Duty, required of all officers.

4. Two drills per week, also the Non-Commissioned Officers' School of one hour per week. Drill regulations and Guard Duty, required of all officers.

5. Elective. Two drills and Officers' School of one hour per week. Drill regulations, Guard Duty and Army Regulations.

6. Elective. Continuation of Course 5.

7. Elective. Two drills and Officers' School of one hour per week; Service of security and information, Military Engineering, Military Law and Military Hygiene.

8. Elective. Continuation of Course 7.

THE LIBRARY.

MISS VINA ELETHE CLARK, LIBRARIAN.
MISS CAROLYN GRIMSBY, REFERENCE LIBRARIAN.
MISS MARGARET FORGEUS, LIBRARY CATALOGUER.
MISS CAROLINE E. LAIRD, ASSISTANT LIBRARIAN, ENGINEERING LIBRARY.
MISS VERA MORLAN DIXON, ASSISTANT LIBRARIAN, GENERAL LIBRARY.
MISS ROBINA MARGUERITE RAE, ASSISTANT IN AGRICULTURAL LIBRARY.
MISS NELLIE MORRIS SMITH, ASSISTANT CATALOGUER.

The College Library, consisting of over 30,000 volumes and 10,000 pamphlets, is chiefly a library of reference containing standard and technical works bearing particularly upon the lines of work pursued in in College. These include standard works of history, biography, engineering, agriculture, natural sciences, mental and moral philosophy, poetry, general literature and reference. The books are selected with great care the heads of the departments indicating such works as they wish the library to have bearing upon their respective lines of work.

A few years ago the College received by bequest about 1,500 volumes pertaining to Engineering and Economics from the library of the late Geo. W. Catt. This Engineering Library with that section of books from the general collection has been made a Departmental Library located in Engineering Hall.

An Agricultural Library has been established in the new Hall of Agriculture.

The library is classified according to the Dewey Decimal System of Classification and the card catalogue is in two parts, the Dictionary (author and title) and Classed.

The library is in constant receipt of large numbers of publications from the various departments of the government, agricultural experiment stations and other sources. The library has also several hundred bound volumes of government publications, such as Geological Surveys, United States Experiment Station Bulletins, Congressional Record, Census Reports, and Cabinet Officers' Reports.

The library receives about 250 periodical publications, literary, scientific and general, and there are complete files of many of these upon the shelves.

The library subscribes for several dailies and, through the courtesy of the editors, a large number of the daily and country newspapers of Iowa are sent to the reading room for the use of students.

The reading room of the library is open to readers eleven and one-half hours daily, except Sundays, when it is open three hours. Current numbers of periodicals are kept in the reading room and are accessible to all, as are newspapers, college exchanges, dictionaries, encyclopedias, Poole's Index, the card catalogue, etc.

Personal assistance and suggestions upon all matters relating to the library will be given by the librarian and assistants to all who desire such help .

COURSE IN LIBRARY WORK.

1. **Library Work.** Four hours in fall semester.

DEPARTMENT OF PHYSICAL EDUCATION AND ATHLETICS.

J. P. WATSON, PHYSICAL DIRECTOR.
S. C. WILLIAMS, ASSOCIATE.
HOMER HUBBARD, ASSISTANT.
E. W. LAMBERT, ASSISTANT.

Since the college is not favored with a gymnasium, the systematic physical work is greatly handicapped. With the exception of basketball and early spring work, all of the work is done out-of-doors. All students are encouraged to take some form of exercise that their physical welfare during college life may be normal and that their bodies may be healthy on entering their life's work. The amount of work of each individual is regulated by the Physical Director and College Physician, the object being a perfect condition attained by working up slowly. None of the work is compulsory, nor is any fee charged. During the sophomore year, athletics and physical training is made optional with military drill.

The department is under faculty control and the College is a member of the Missouri Valley Conference of Faculty Representatives.

The Board of Trustees voted to authorize the construction of a modern gymnasium of sufficient capacity to meet all requirements of the College from the "Building Tax." This action was confirmed by the legislature, and the building will be started in 1911.

The several branches of physical training and athletics are given below. Each sport receives the personal attention of one or more competent instructors. The development of winning athletic teams is not unduly exalted. The man who stands no chance of representing the college in intercollegiate contests is encouraged to participate as well as the athletic "phenom."

TRACK WORK.

Fall Semester.—

For exercise and general development.—Light track and field work.

For Freshmen-Sophomore Meet.—Special and systematic work on track and field.

For Cross Country Running.—Special training in the way of walks and cross country work. A handicap meet open to all is run, and suitable trophies given the winners. A team represents the College in the Chicago Cross Country Meet.

Spring Semester.—

For exercise and general development.—Light track and field work.

For Home Meet.—Special and systematic work on track and field.

For Intercollegiate Meets.—Special and systematic work on track and field.

Talks by Physical Director on sportmanship, training, how to train, results of training, etc.

FOOTBALL.

Much attention and encouragement are given the inter-class games. They are considered as not only beneficial to the participants, but also as a help to the student body and College in general.

Special training and coaching are given the team representing the College in intercollegiate games.

BASEBALL.

Inter-class and department games are encouraged. Several diamonds are laid out on the campus, providing room for the many who care to follow this form of exercise. A splendid trophy in the form of a loving cup was donated by the class of '08 for the winner of the inter-class contests.

Special training and coaching are given the team representing the College in intercollegiate games.

BASKETBALL.

During the winter months basketball is the only form of exercise offered by the department. Beside the general exercise offered to all, class teams have their schedules and a team represents the College in intercollegiate games.

TENNIS.

Tennis courts are provided and cared for. These are open to all. Inter-class schedules are played both in the fall and spring, the latter for the McKay Tennis Trophy. This is a beautiful and costly loving cup presented by Professor George L. McKay, formerly head of the Dairy Department of the College. A team represents the College in intercollegiate games.

PHYSICAL CULTURE FOR WOMEN.

WINNIFRED RICHARDS TILDEN, DIRECTRESS.

Training in Physical Culture is required of the young women throughout the Freshman and Sophomore years. The work is given in two forty-five minute periods each week.

Before admission to the gymnasium classes, each student must be examined by the director with reference to physical development, strength of heart and lungs, and hereditary tendencies. These examinations with measurements are given at the beginning and close of each year's work. No student will be excused from the regular exercises except by order of the College physician.

The Swedish System of gymnastics, including marching tactics, calisthenics, and apparatus work, is taught. The highest ideals are kept constantly before the mind, not only health and strength, but ease, grace and refinement in manner and carriage of the body.

Facilities for basketball, tennis, and field hockey are provided. During the first six weeks in the fall and the last six weeks in the spring, the physical training will be out of doors and each student may choose which of the above mentioned sports she prefers. The regular gymnasium work begins the middle of October and continues until the middle of April.

Gymnasium uniform consists of dark blue serge regulation bloomers, Gymnasium shoes and white blouse. **The blouse will be ordered by Physical Directress after classification.**

COURSES IN PHYSICAL CULTURE.

1. **Marching Tactics.** Exercises for correct standing, walking, and breathing, marching tactics, figure marching. First term wand and games. Two hours per week. Fee, $1.00.

2. **Calisthenics.** Calisthenics, marching tactics. Second term wands and dumb bells. Two hours per week. Fee, $1.00.

3. **Light Apparatus.** Second term, dumb bells and Indian clubs. Light apparatus work. Two hours per week. Fee, $1.00.

4. **Swedish Gymnastics.** Bar bells, apparatus work, stall bars, ladders, rings, etc. Fee, $1.00.

5. **Advance Work on Apparatus and Fencing** are offered to students having had Course 4.

DEPARTMENT OF MUSIC.

ALEXANDER STEWART THOMPSON, DIRECTOR, PIANO, PIPE ORGAN, VOICE AND THEORY.

CLARA DUTTON THOMP.ON, VICE-DIRECTOR. VOICE, PREPARATORY PIANO AND ORGAN.

INGEBORG SVENDSEN TUNE, INSTRUCTOR IN PIANO.

MORRIS EARLE MITCHELL, INSTRUCTOR IN VIOLIN.

CHARLES L. MUNDHENK, BRASS INSTRUMENTS.

Ames Conservatory of Music is established as a Department of the College. It is essentially a school of musical learning. It stands for high ideals, and strives by means of thorough training to develop to the highest stage of artistic capability all those possessing musical talent.

All grades of instruction are given from the beginning to the most advanced ideas in interpretation.

Students entering will always find it desirable to bring a musical selection well prepared to perform before the Director, or before the teacher, at the first lesson. In this way only can a satisfactory opinion be formed as to the student's ability, grade of advancement, or character of the previous study.

Complete courses are offered in Pianoforte, Pipe Organ, Voice, Harmony, Counterpoint, Canon, Fugue, Analytical Harmony and Form, Composition and Musical History. Other courses are offered in Ensemble Music, Sight Reading, Chorus Singing, Choir and Band Practice.

All of the recitals by students and the recitals and lectures given by the instructors are free to all of the music students, also practice in the college choir. The music students in common with all of the college students have many opportunities of hearing distinguished speakers on the college platform, which opportunities conduce largely to the mental culture and development of the earnest student. A large state institution like Iowa State College offers much more advantage to hear the great speakers than the smaller institutions.

The Literary Societies of the college are open to students of the Conservatory.

From time to time great musical artists will be heard at the college. For these entertainments a charge will be made, and all musical students are expected to attend.

The Conservatory admits two classes of students: The College music students who have met the full entrance requirements for admission to the Freshman class in the Science Course, and take not less than six hours per semester of College work in addition to their work in Music, and the students not meeting these requirements, known as Music Students.

Young women taking the College Music Course may room in Margaret Hall under the same arrangements as any other college student.

COURSES OF STUDY.

THEORY.

HARMONY.

Text-book—Goetschius. The Material used in Musical Composition.

Keys, scales, and signatures; intervals, the triads, chord connection, simple part writing, and keyboard work.

Harmonizing basses, inversions, chords of the sixth, keyboard work, and ear training.

Second Term. Chords of the sixth continued. Chords of the seventh and their inversions. Modulation begun. Chords of the seventh and their inversions continued. Chords of the ninth.

Third Term. Harmonization of Melodies begun. Modulation. Altered and Augmental Chords.

Fourth Term. Suspensions, Retardations, and Organ Point. Single Counterpoint in two parts. One, two, three and four notes against one. Florid Counterpoint. Text-books, Dr. Frederick Bridge or Dr. Francis E. Gladstone on Counterpoint.

CANON AND FUGUE.

Text-book—Richter Double Counterpoint and Fugue, Higgs on Fugue.

ANALYTICAL HARMONY.

Open to students who have completed course in Harmony.

Study of harmonic structures and general study of musical form.

COMPOSITION AND INSTRUMENTATION.

Study of form and composition and the instruments of the orchestra, etc.

HISTORY OF MUSIC.

General history, development and influence of music among ancient peoples. Early Christian music. Polyphonic music.

Various schools of polyphonic music. The rise of dramatic and instrumental music, and the development of the various musical instruments.

The development of the Opera and Oratorio. The Romanticists. Modern music and musicians.

The above course can readily be accomplished in one year with two recitations a week. As the general object of the study is cultural, College students not pursuing music specially would be greatly benefited in a cultural sense by the pursuit of this study.

INTERPRETATION CLASSES.

The study of harmony is a prerequisite to entrance into this class.

The principal idea in the work of the classes in Interpretation is "How to make music interesting." The work of this class is under the personal instruction of the Director, and all students in all departments are urged to broaden their musical horizon by attending for at least a few terms. Different composers, different instruments, tradition in song, the Rubato, and contrasts in tone color will be some of the subjects discussed. Many compositions will be performed by both students and teacher, and the culture here derived will be of the most practical sort.

PIANO.

The course in this department is intended to meet the varying needs of individual pupils, with the idea of furnishing a comprehensive, rather than a rigid, inelastic training in piano-forte technic. While the acquirement of finger dexterity is necessary, the value and importance of the mental training to be obtained from the study of music is emphasized and the course is expected to make apparent the advantage of a broad musical education.

Preparatory Course.

The Preparatory Course is sufficiently simple to include beginners, and requires the study of the following exercises: Stephen Emory's Foundation Studies; Herz Scales; Handrock's Mechanical Studies; Enckhausen Progressive Melodious Studies, four books; Ehmant Petite Ecole Melodique, four books; Mathew's Graded Course, first four books.

The major and minor scales and major and minor chords must be played from memory, besides a variety of musical figures suggested by the various composition. These points are brought out by the use of works by Kohler, Duvernoy, Burgmuller, Gurlitt, and Schumann's studies for young students.

These fundamentals must be fully mastered before a pupil can be classified as a student in the Advanced Musical Course. The mastery of these principles is of the greatest importance, as it is the only way to secure intelligent and sure progress in the advanced stages. No efforts will be spared to induce the student to work with that personal relish so necessary to good work.

Advanced Course.

First Year. Major and minor scales and arpeggios.

Mathew's Graded Course, Books 5 and 6; Mason's Technics;

Beren's New School of Velocity, Books 1 and 2; Selections from Clementi and Kuhlau Sonatinas; Pieces by Bohm, Thome, Godard, Lebierre, Sapelnikoff, suitable novelties American or foreign.

Second Year. Scales and Double Thirds, etc.

Mathew's Graded Course, Book 7; Mason's Technics; Beren's New School of Velocity, Books 3 and 4; Low's Octave Studies; Selections from Haydn and Mozart Sonatas; Selections from Mendelssohn's Songs Without Words; Easier pieces of Chopin, also pieces by modern authors Chaminade, Rachmaninoff.

Third Year. Bach, Two-part Inventions, Preludes and Fugues, Cramer's Studies or Neupert Studies. Kullak's Octaves. Beethoven Sonatas. Compositions by Chopin, Schumann, Schubert, Grieg or other standard authors.

Fourth Year. Bach continued. Chopin Etudes, Beethoven Sonatas. Advanced Chopin and Liszt compositions or other suitable difficult pieces.

PHYSICS COURSE.

508. Sound. Required of all regular music students. A discussion of the theory of sound with special reference to music. The course includes a study of the nature of sound, the physics of the musical scale, and those topics, such as tone quality, resonance, etc., which are of special interest and importance to the student of music. Lectures, one hour per week.

VOICE.

The aim of this course is to develop, through deep breathing properly applied to voice placement, that full, resonant tone which has always characterized the artists trained in the Italian school, to attain a clear enunciation, a keener appreciation of the subtler meanings of the verbal text and an understanding of the foundational principles underlying all musical interpretation to the end that the singing may be distinguished by musicianly, scholarly qualities and deep, human sympathy.

Preparatory Course.

Breathing and voice placing exercises; sustained tones and scale work according to the Italian method as taught by Sims Reeves, of London, England, and Vannucini, of Florence, Italy. Concone's Fifty Lessons; Concone's Forty Lessons for Bass; Marchesi's Exercises, Op. 1, First Part; Vaccai's Studies.

Advanced Course.

First Year. Voice placing exercises; scales, sustained notes, and articulation exercises; Marchesi's Studies; Concone's Twenty-five Lessons; songs by American composers, Denza, Cowen, Gastaldon, Jensen, Grieg, and Mendelssohn.

Second Year. Voice placing exercises continued; scales, etc., Marchesi's Studies; Concone's Fifteen Lessons; songs or solos by Schubert, Schumann, Grieg, Handel, or other good foreign and American composers.

Third Year. Advanced studies and exercises; solos from the standard oratorios and operas. Handel, Haydn, Mendelssohn, Mozart, and a few of the Italian or French composers.

Fourth Year. Review of Handelian arias; Beethoven, Wolf, Strauss, Brahms, and Franz songs; Wagnerian, and other opera solos.

Sight-Singing.

Beginning Class—The work will embrace a thorough explanation of all the fundamental principles of music—notes, time, keys, major scales, intervals, arpeggios, common chords and chromatics. Special work in ear training.

Advanced Class.—The work will embrace the study of minor and chromatic scales, dominant and diminished seventh chords. Mordent, trill, appoggiatura, acciaccatura. Ear-training. Sight reading will be the great feature; and all who may understand the principle of reading at sight, yet do not have a practical knowledge thereof, will find the glees, anthems, part songs, etc., very interesting.

PIPE ORGAN.

In this course it is desirable that a student should have had a thorough course in piano finger technic, and have taken at least a year of Harmony as a prerequisite. As natural adaptation for the organ plays a great part in the student's progress on organ an outline only of the work is given.

The course comprises simple exercises for developing correctness and fluency in pedal playing; Thayer's Pedal Studies, together with easy preludes, chorals and trios, for cultivation of independence in manual and pedal; the easier works of Bach, Mendelssohn, Merkel and others.

Volckmar's Pedal Studies; Buck's Studies in Pedal Phrasing; Sonatas from Mendelssohn, Rheinberger, Ritter, and Bach.

The works of the modern French school form a large part of the repertoire taught in this course.

VIOLIN.

The aim in this course is to develop players of fine quality and to develop executive and interpretive power in the highest degree.

Preparatory Course.

Franz Wolfart, Book 1.

Violin Method for Beginners, O. Sevcik, Parts I, VI, VII. Easy pieces.

Advanced Course.

First Year. Preparatory method of Violin Technics, O. Sevcik. Books I and II. Changes of Position and Preparatory Scale Studies. Prep. Studies in Double Stopping in Thirds, Sixths, Octaves, and Tenths. Pieces by DeBreriot and others.

Second Year. Etudes by Kreutzer, Fiorillo and Rode. Concertos by Mozart, Wieniawski, and pieces by classic and modern composers.

Third Year. School of Violin Technics for Advanced Pupils, O. Sevcik, Books I, II, III, and IV; Exercises in Double Stopping, Triple and Quadruple Stopping, Pizzicato, Flageolet-tones. Solos from Wieniawski, Ernst, and Vieuxtemps.

Fourth Year. 40 Variations, O. Sevcik. Bow technics. Preludes Campagnoli, Caprices Paganini. Concerts from Paganini, Mendelssohn, Beethoven, Bruch, Saint Saens, etc.

SUPERVISOR MUSIC COURSE.

This course is designed for those students who are desirous of making a specialty of teaching music in the public schools. A thorough mastery of singing by syllable is one of the great objects to be attained in conjunction with as thorough cultivation of the voice as the time will permit. In the second semester methods and study of the child voice will be taken up. Musical History and Harmony are continued throughout the year.

In order that those taking this course should be useful in the school system it was deemed advisable to include a drawing course that would enable one to teach that branch in public school, if necessary. On the completion of the course a certificate will be issued.

MUSIC COURSE. ONE YEAR.

Prerequisites.

Graduation from an accredited high school or its equivalent. Ability to play piano, fourth grade, with a full knowledge of the major and minor scales.

Voice Culture. Two semesters. Two private lessons a week.

Harmony. Two semesters. Two class lessons a week.

Sight Singing. Two semesters. One hour a week.

Musical History. Two semesters. Two class lessons a week.

Methods of Public School Music Teaching and Study of the Child Voice. One semester. One hour a week.

Tuition for this course: First semester, $42.00; second semester, $58.00.

DRAWING COURSE.

Special course in Drawing, arranged for students taking music.

1. **Mechanical Engineering 19.** A course in isometric drawing and linear perspective. One hour credit. Four hours' drawing per week.

2. **Mechanical Engineering 121.** A course in mechanical drawing. Practice in the use of drawing instruments, lettering and making working drawings. Two hours' credit. Six hours' drawing per week.

3. **Mechanical Engineering 322.** Mechanical Drawing. Sketching and detailing of machine parts and architectural subjects. One hour credit. Three hours' drawing per week. If desired, can be extended to two hours' credit, six hours' drawing per week.

4. **Mechanical Engineering 423.** Mechanical Drawing. A continuation of Course 322. Making of working drawings, tracings, and blue prints. Two hours' credit. Six hours' drawing per week.

Drawing periods are usually for three consecutive hours. Students should not classify for less than two consecutive hours in one period.

BAND INSTRUMENTS.

Instruction is given in these instruments by Charles L. Mundhenk, the director of the College Band.

CHORAL SOCIETY CONCERTS.

At least two concerts will be given during the year by the Choral Society on which occasions the Society will be assisted by celebrated musical artists from abroad.

Such works as Barnby's Rebekah, Gaul's Holy City, Buck's Forty-Sixth Psalm, Coleridge Taylor's Hiawatha's Wedding Feast, Cowen's Rose Maiden, A. S. Thompson's Lazarus, Handel's Messiah, and Mendelssohn's Elijah have been given successfully. Such artists as Madame Isabelle Bouton, Wm. Frederic Martin, Dr. Carl Dufft, Dr. Ian Jackson, of New York, Madame Sibyl Sammis Macdermid and Mr. Garnett Hedge, of Chicago, as well as Madame Frieda Langendorff, of Berlin, have sung with the Choral Society or in the Artists' Course.

A fine Ladies' Glee Club gives one concert each year. Members of this club are selected by Mrs. Thompson, the directress.

An excellent Male Glee Club gives concerts each semester. Membership in this organization is gained by examination by the Director, A. S. Thompson, and the vote of the members.

REGULATIONS.

Students must register and secure entrance cards (each semester) before they begin their lessons. A student may register at the beginning of the semester or for the unexpired portion thereof. The entrance card must be presented to the instructor at the first lesson.

All tuition is payable at time of registration. No deviation from this rule will be permitted unless the pupil, parent, or guardian makes application to the Director for an extension of time.

Students may enter at any time. Students may enroll for music alone without additional expense.

No pupil will be allowed to register at the regular semester rates for less than a full semester. Pupils taking less than a full semester will pay for their lessons at the following rates: Half-hour private lessons with Alexander S. Thompson, $1.25. Class lessons in Harmony, etc., 50 cents. Half-hour private lessons with Mrs. Thompson, $1.25. Half-hour private lessons with Miss Svendsen-Tune or Norris Earle Mitchell, $1.00.

Only in case of protracted illness (two weeks' or more duration), certified by a physician's statement, can any deduction be made for absence from lessons. In such cases the pupil will pay at the above rates for the lessons he has received, and the balance of the tuition paid will be refunded. All claims of this nature must be made and settled before the end of the term in which the absence occurs.

Students may enter the Conservatory at any time, but it is greatly to their advantage to enter, if possible, at the beginning of the semester.

Students entering within two weeks of the beginning of the semester will be charged for the full semester; after that time for the remainder of the semester and one week additional.

Tuition per Semester.

The following table shows the rates of tuition for private lessons of thirty minutes in length, one lesson or two lessons a week:

	First Semester		Second Semester	
Vocal:	One	Two	One	Two
Alexander Stewart Thompson	$16.00	$30.00	$20.00	$37.50
Clara Dutton Thompson	16.00	30.00	20.00	37.50
Piano:				
Alexander Stewart Thompson	16.00	30.00	20.00	37.50
Ingeborg Svendsen-Tune	14.50	27.00	18.50	30.00
Juveniles in Piano	13.00	23.00	15.00	27.00

	First Semester		Second Semester	
	One	Two	One	Two
Harmony, Counterpoint or Fugue, etc.: (Private)	$13.00	$23.00	$15.00	$27.00
Pipe Organ:				
Alexander Stewart Thompson	16.00	30.00	20.00	37.50
Brass Instruments:				
Charles L. Mundhenk	13.00	23.00	15.00	27.00

	First Semester		Second Semester	
Violin, etc.:	One	Two	One	Two
Norris Earle Mitchell	$14.50	$27.00	$18.50	$33.00
Ensemble:				
Norris Earle Mitchell	14.50	27.00	18.50	33.00

Class Lessons.

Sight Singing Class:	Two Lessons a Week	
Not less than ten in a class (one hour a week)	$ 2.50	$ 3.50
Harmony class	8.50	11.50
Counterpoint and Fugue	11.00	14.00
Interpretation:		
Class limited to ten	6.50	8.50
Musical History	4.00	6.00

Other Expenses.

Piano Practice, one hour per day for the semester, $3.50; two hours per day, $6.50; three hours per day, $9.00.

Pipe Organ Practice, four hours per week for the first semester, $6.00; second semester, $7.50. Additional hours, if organ is available, at the same rate.

List of Students

FORENSIC CONTESTS.

Declamatory Contest, Spring Semester, 1909.

Oratorical Class—J. G. Emerson, Welch. "Lincoln-Douglas Debates."

Dramatic Class—Eloise Schworm, Clio. "The Hazing of Valiant."

Oratorical Contest, Fall Semester, 1909.

First Prize—Howard T. Hill, Forum. "The Value of Practical Scholarship."

Second Prize—J. H. Burlingame, Phileleutheroi. "Currency Reform."

Third Prize—J. G. Emerson, Welch. "China's White Peril."

Intersociety Debates, Spring Semester, 1909.

Question: "Resolved, That congress should establish a system of postal savings banks."

I. Debates in Kennedy Cup Contest.

Following the debates of the fall semester, 1908, the following societies were left to compete for the first award of the Kennedy Cup: Pythian, Crescent, Forum, Philomathean. The debaters were as follows, the winning society being named first in each contest.

O. W. Johnson, E. C. Davis, C. R. Shumway, Crescent, vs. Howard T. Hill, H. C. Darger, Wroe Compton, Forum.

A. A. Burger, Rex Davidson, Howard Vaughn, Pythian, vs. E. L. Quaife, R. J. Mason, F. W. Hinkhouse, Philomathean.

Final Contest: O. W. Johnson, C. R. Shumway, E. C. Davis, Crescent, vs. Howard Vaughn, A. A. Burger, R. G. Jones, Pythian.

Intercollegiate Debates, Fall Semester, 1909.

Debating League of Iowa State College and Iowa State Teachers' College. Fourteenth annual debate, fourth in series of dual debates.

Question: "Resolved, That congress should establish a system of postal savings banks."

Affirmative for Iowa State College, at Cedar Falls.
C. R. Hutcheson, Philomathean.
E. C. Davis, Crescent.
Murl McDonald, Welch.
Negative for Iowa State College, at Ames.
Hugh Webster, Crescent.
J. S. Naylor, Philomathean.
H. C. Darger, Forum.

Intercollegiate Debates, Spring Semester, 1910.

I. State Triangular Debating League. (Iowa College, Drake University, Iowa State College.) Fifth annual debate.

Question: "Resolved that congress pass an income tax law, constitutionality granted."

The affirmative team for Iowa State College, at Grinnell, against Iowa College:
Roy C. Palmer, Welch.
A. F. Lungren, Philomathean.

Thos. McCall, Forum.

The negative team for Iowa State College, at Ames, against Drake University:

J. H. Burlingame, Phileleutheroi.
E. L. Quaife, Philomathean.
J. M. Fuller, Philomathean.

II. Interstate Debate. University of South Dakota vs. Iowa State College. First annual Debate.

The affirmative team for Iowa State College at Ames:

Theodore Macklin, Phileleutheroi.
A. A. Burger, Pythian.
P. E. Miller, Philomathean.

The negative team for Iowa State College, at Vermilion, S. D.:

C. R. Shumway, Crescent.
Howard Vaughn, Pythian.
Howard T. Hill, Forum.

Declamatory Contest, Spring Semester, 1910.

Oratorical Class—E. L. Quaife, Philomathean. "The Patriotism of Stephen A. Douglas."

Dramatic Class—James Watson, Beardshear. "Tam O'Shanter."

SENIOR HONOR STUDENTS, 1910.

Each of the following has the highest average standing in the course represented:

D. W. McElroy, Electrical Engineering.
Mildred Semmons, Science.
H. Wallace, Animal Husbandry.
Carl H. Schemann, Civil Engineering.
H. D. Bergman, Veterinary.
J. J. Nicolay, Mechanical Engineering.
Amy Parsons, Domestic Economy.
E. S. Estel, Dairying.
M. F. Beecher, Ceramics.

GRADUATE STUDENTS.

Candidates for the Degree of Master of Scientific Agriculture.

Barker, J. F., B. S. A., (Ohio State University) 1908, Soils.
Brecken, W. D., B. S. A., (Toronto University) 1906, Animal Husbandry.
Campbell, J. R., B. S. A., (Iowa State College) 1909, Botany.
Evans, C. M., B. S. A., (A. and M. College of Texas) 1908, Animal Husbandry.
Gonzalez, Juan A., B. S. A., (Iowa State College) 1909, Soils.
Guernsey, S. C., B. S. A., (Iowa State College) 1909, Chemistry.
Harrison, Ernest, B. Sc. (Agric.), (University Edinburgh, Scotland) 1909, Animal Husbandry.
Jeffs, Royal E., B. S. A., (Iowa State College) 1906, Botany.
Lauderdale, J. R., B. S., (A. and M. College of Texas) 1908, Farm Crops.
Madson, B. A., B. S. A., (Iowa State College) 1907, Chemical Section.
Merritt, M. L., B. S. A., (Iowa State College) 1904, Horticulture.
Miller, R. F., B. S. A., (Texas State College) 1909, Animal Husbandry.
Patterson, G. W., B. S. A., (Iowa State College) 1909, Animal Husbandry.
Smith, Roy E., B. S. A., (Iowa State College) 1909, Soils.

Watson, James A. S., B. Sc. (Agric.), (University of Edinburgh) 1908, Animal Husbandry.

Candidates for the Degree of Master of Science.

Bakke, A. L., B. S., (Iowa State College) 1909, Botany.
Ewing, Henry Ellsworth, A. B., (University of Illinois) 1906, M. A., (University of Illinois) 1908, Zoology.
Hayden, Ada, B. S., (Iowa State College) 1907, Botany.
Mackintosh, R. S., B. of Agr., (University of Minnesota) 1902, Horticulture.
Ness, Henry, B. S. A., (Iowa State College) 1905, Zoology.

SENIORS.

NAME	COURSE	TOWN	COUNTY
Adams, Harold E.,	C. E.,	Cedar Rapids,	Linn.
Andre, Edna,	Sci.,	Schaller,	Sac.
Armstrong, Alice,	Sci.,	Chicago,	*Illinois.*
Austin, Fred H.,	C. E.,	Webster City,	Hamilton.
Baker, Margaret,	D. E.,	Rockwell City,	Calhoun.
Baker, H. Ream	Mn. E ,	Eldon,	Wapello.
Barndt, H. P.,	Mn. E.,	Des Moines,	Polk.
Barry, O. T.,	M. E.,	Cedar Rapids,	Linn.
Beattie, William S.,	C. E.,	Weldon,	Decatur.
Beecher, Milton F.,	Cer.,	Mason City,	Cerro Gordo.
Bergman, H. Dale,	Vet.,	Newton,	Jasper.
Beuck, Henry,	A. H.,	Avoca,	Pottawattamie.
Bittenbender, Harry A.,	A. H.,	Osage,	Mitchell.
Black, William H.,	A. H.,	Ft. Dodge,	Webster.
Blumenschein, Ed. W.,	C. E.,	Rhodes,	Marshall.
Board, Arley R.,	E. E.,	Marcus,	Cherokee.
Boden, Oscar G.,	C. E.,	Ames,	Story.
Boling, Alvy J.,	M. E.,	Bagley,	Guthrie.
Bolles, Lawrence,	C. E.,	Ames,	Story.
Booher, Edith,	Sci.,	Danbury,	Woodbury.
Brown, Charles W.,	Vet.,	Grand Junction,	Greene.
Buell, W. Elijah,	C. E.,	Lyons,	Clinton.
Bullen, Arthur,	M. E.,	Pueblo,	*Colorado.*
Burger, Arthur,	A. H.,	Van Meter,	Dallas.
Butler, Deo V.,	C. E.,	Nashua,	Chickasaw.
Cable, Emil Y.,	Agron.,	Ames,	Story.
Calonkey, Josephine,	Sci.,	Woodward,	Dallas.
Campbell, Carlyle,	Dairy,	Ames,	Story.
Campbell, George S.,	M. E.,	Newton,	Jasper.
Carlson, Ruben Q.,	A. H.,	Meriden,	Cherokee.
Carson, H. J.,	M. E.,	Council Bluffs,	Pottawattamie.
Chase, May,	Sci.,	Colorado Springs,	*Colorado.*
Chase, Orrin A.,	C. E.,	McIntire,	Mitchell.
Chatterton, Ralph,	E. E.,	Peterson,	Clay.
Cheney, Harold C.	A. H.,	Emerson,	Mills.
Clark, Sadie,	Sci.,	Ames,	Story.
Cleveland, W. J.,	Vet.,	Humboldt,	Humboldt.
Cline, J. D.,	Vet.,	Ames,	Story.
Collins, Floyd F.,	A. H.,	Indianola,	Warren.
Conger, Carol,	Sci.,	Adel,	Dallas.
Cooley, Dick M.,	M. E.,	Strawberry Pt.,	Clayton.

Cooney, F. H ,	C. E.,	Coon Rapids,	Carroll.
Cooper, E. E.,	A. H.,	Corning,	Adams.
Copeland, F. B.,	Vet.,	Logan,	Harrison.
Corlette, Lyle,	E. E.,	Ames,	Story.
Coutts, H. G.,	C. E.,	Grinnell,	Poweshiek.
Cover, Leo G.,	E. E.,	Dunlap,	Harrison.
Cox, I. W.,	C. E.,	Ames,	Story.
Cox, Lawrence W.,	C. E.,	Ames,	Story.
Coykendall, Claude,	C. E.,	Dedham,	Carroll.
Cramer, William H.,	M. E.,	Reasnor,	Jasper.
Creel, Edward J.,	A. H.,	Chihuahua,	*Mexico.*
Crewdson, Archie,	Vet.,	Woodbine,	Harrison.
Crowley, Paul W.,	Dairy,	Galva,	Ida.
Dahlby, I. E.,	A. H.,	Joice,	Worth.
Davis, Charles W.,	A. H.,	Allison,	Butler.
Davis, Ralph E.,	M. E.,	New Virginia,	Warren.
Deacon, Eugene L.,	C. E.,	Ames,	Story.
Deal, Maude M.,	D. E.,	Ames,	Story.
Dorsey, Sherman H.,	M. E.,	Greenfield,	Adair.
Dragoun, Frank,	C. E.,	Toledo,	Tama.
Drury, William F.,	C. E.,	Ames,	Story.
Eby, Charles W.,	C. E.,	Waterloo,	Blackhawk.
Edmonds, Walter E.,	M. E.,	Sioux City,	Woodbury.
Egan, Charles B.,	C. E.,	Atlantic,	Cass.
Estel, Edward S.,	Dairy,	Marshalltown,	Marshall.
Everett, Edna,	Sci.,	Spirit Lake,	Dickinson.
Evers, Harry C.,	Vet.,	Iowa Falls,	Hardin.
Ewen, Earl,	A. H.,	Callender,	Webster.
Fedderson, M. H.,	A. H.,	Bryant,	Clinton.
Fleming, Mabel,	Sci.,	Ames,	Story.
Forrest, Augustus,	Dairy,	Garner,	Hancock.
Fowler, Emery S.,	C. E.,	Radcliffe,	Hardin.
France, Bert L.,	A. H.,	Moville,	Woodbury.
Fultz, T. G.,	Vet.,	Ames,	Story.
Gilbert, Ray,	Vet.,	Gilbert Station,	Story.
Glidden, Edith,	D. E.,	Ames,	Story.
Gockley, W. L.,	M. E.,	Whittemore,	Kossuth.
Graham, Robert,	Vet.,	Ames,	Story.
Gray, R. B.,	A. E.,	Des Moines,	Polk.
Green, S. Rex,	C. E.,	Ames,	Story.
Greer, Murl	Sci.,	Ames,	Story.
Gregory, C. V.,	A. H.,	Burchinal,	Cerro Gordo.
Griffith, Bessie,	Sci.,	Ames,	Story.
Hallowell, Inez,	D. E.,	Dow City,	Crawford.
Hamilton, James W.,	Vet.,	Hawarden,	Sioux.
Harp, Paul W.,	A. H.,	Prairie City,	Jasper.
Haskins, Walter A.,	Agron.,	Whitten,	Hardin.
Haw, Elmer,	C. E.,	Ottumwa,	Wapello.
Heggen, Albin,	A. H.,	Des Moines,	Polk.
Herbert, Howard M.,	A. H.,	Atlantic,	Cass.
Hill, Howard T.,	Sci.,	Ames,	Story.
Horton, J. Omro,	C. E.,	Ames,	Story.
Hubbard, Homer C.,	M. E.,	Ida Grove,	Ida.
Hukill, E. C.,	A. H.,	Des Moines,	Polk.
Hungerford, Josephine,	Sci.,	Carroll,	Carroll.
Hyland, John L.,	C. E.,	Osceola,	Clarke.
Johnson, Fred B.,	E. E.,	Waukon	Allamakee.
Johnson, George B.,	E. E.,	Decorah,	Winneshiek.
Johnston, W. D.,	C. E.,	Waterloo,	Blackhawk.

Joiner, Melvin W.,	A. H.,	Maquoketa,	Jackson.
Jones, Frank O.,	C. E.,	Ames,	Story.
Jones, Helen M.,	D. E.,	Allison,	Butler.
Kemler, Clarence H.,	C. E.,	Dubuque,	Dubuque.
Kingman, Floyd,	Agron.,	Des Moines,	Polk.
Knudson, Susie,	Sci.,	Nevada,	Story.
Korf, E. T.,	C. E.,	Newton,	Jasper.
Kraft, John H.,	C. E.,	Des Moines,	Polk.
Kyhl, Louis C.,	E. E.,	Miles,	Jackson.
Lambert, Everett W.,	Mn. E.,	Ames,	Story.
Landis, Gene B.,	M. E.,	Keosauqua,	Van Buren.
Lane, W. G.,	M. E.,	Mason City,	Cerro Gordo.
Langseth, Ruth,	D. E.,	Dixon,	Scott.
Laughlin, Floyd L.,	A. H.,	Osage,	Mitchell.
Law, Virgil V.,	M. E.,	Ames,	Story.
Leffler, J. M.,	A. H.,	Stockport,	Van Buren.
Lemon, L. Clyde,	C. E.,	Spirit Lake,	Dickinson.
Lockwood, Howard,	A. H.,	Central City,	Linn.
Loring, David M.,	C. E.,	Lone Tree,	Johnson.
Lungren, Arthur F.,	Sci.,	Gowrie,	Webster.
Madson, Anna,	D. E.,	Ames,	Story.
Madson, Nina,	Sci.,	Ames,	Story.
Mantor, H. O.,	Vet.,	Ames,	Story.
Mason, James W.,	E. E.,	Hedrick,	Keokuk.
Matter, Otto,	E. E.,	Waukon,	Allamakee.
Maytag, L. B.,	M. E.,	Newton,	Jasper.
Menary, Albert R.,	Vet.,	Cedar Rapids,	Linn.
Mercer, Jay M.,	E. E.,	Greenfield,	Adair.
Merten, Charles F.,	C. E.,	Garner,	Hancock.
Meyer, J. Elmer,	C. E.,	Marcus,	Cherokee.
Miller, Howard C.,	C. E.,	Eldora,	Hardin.
Miller, Roy E.,	C. E.,	Estherville,	Emmet.
Mirick, Maude,	Sci.,	Monticello,	Jones.
Morrison, G. W.,	M. E.,	Adelphi,	Polk.
Murray, Charles,	Sci.,	Ames,	Story.
Myerly, Harry B.,	M. E.,	Des Moines,	Polk.
Myers, B. S.,	C. E.,	Dexter,	Dallas.
Myers, L. Clifton,	A. H.,	Shell Rock,	Butler.
McArthur, William,	A. H.,	Mason City,	Cerro Gordo.
McCall, Thomas,	Hort.,	Ames,	Story.
McCartney, Roy E.,	M. E.,	Cedar Rapids,	Linn.
McCormick, Robert,	C. E.,	Des Moines,	Polk.
McCulloch, B. E.,	Vet.,	Donnellson,	Lee.
McCullough, Conde B.,	C. E.,	Ames,	Story.
McElroy, David W.,	E. E.,	Keokuk,	Lee.
Nelson, George M.,	A. H.,	Goldfield,	Wright.
Nicolay, James J.,	M. E.,	Postville,	Allamakee.
Nielsen, Alfred R.,	Vet.,	Lehigh,	Webster.
Noble, J. A.,	E. E.,	New Market,	Taylor.
Nygren, H. J.,	Vet.,	Lake City,	*Minnesota.*
O'Donnell, M. Walter,	A. H.,	Ames,	Story.
O'Leary, J. E.,	C. E.,	Mason City,	Cerro Gordo.
Olson, Athyl,	D. E.,	Sac City,	Sac.
Palmer, W. H.,	C. E.,	Des Moines,	Polk.
Pammel, Edna	Sci.,	Ames,	Story.
Parsons, Amy,	D. E.,	Keokuk,	Lee.
Pearson, A. F.,	A. H.,	Washington,	Washington.
Peters, Claude H.,	E. E.,	Grinnell,	Poweshiek.
Pooley, Roy J.,	C. E.,	Ames,	Story.

Prouty, Earl D.,	M. E.,	Keokuk,	Lee.
Randau, Fred A.,	A. H.,	Ames,	Story.
Reeves, Arthur B.,	C. E.,	Sibley,	Osceola.
Reynolds, W. E.,	C. E.,	Storm Lake,	Buena Vista.
Roberts, Coral,	D. E.,	Marathon,	Buena Vista.
Rudnick, A. W.,	Dairy,	Chicago,	*Illinois.*
Sanders, J. S.,	Vet.,	Ames,	Story.
Schader, Fred M.,	C. E.,	Preston,	Jackson.
Schemann, Carl H.,	C. E.,	Des Moines,	Polk.
Schroeder, Edward F.,	E. E.,	Davenport,	Scott.
Scoates, Daniels,	C. E.,	So. Milwaukee,	*Wisconsin.*
Scott, C. E.,	Mn. E.,	Shelby,	Shelby.
Semmons, Mildred,	Sci.,	Ames,	Story.
Sherwood, Ross M.,	A. H.,	Shabbona,	*Illinois.*
Shumway, C. R.,	A. H.,	State Center,	Marshall.
Simpson, J. Wallace,	Agron.,	Whittemore,	Kossuth.
Sloan, M. Luther,	E. E.,	Sioux City,	Woodbury.
Smith, Cecile H.,	Sci.,	Ames,	Story.
Soth, A. A.,	M. E.,	Toledo,	Tama.
Sprague, Arthur W.,	Vet.,	Council Bluffs,	Pottawattamie.
Springer, Spencer,	E. E.,	Eddyville,	Wapello.
Steigerwalt, Sam,	C. E.,	Ames,	Story.
Storms, Laura B.,	D. E.,	Ames,	Story.
Taylor, Ilo I.,	C. E.,	Storm Lake,	Buena Vista.
Tellier, G. H.,	Dairy,	Humboldt,	Humboldt.
Thomas, Helen M.,	Sci.,	Charles City,	Floyd.
Thomas, Roy,	Mn. E.,	Buxton,	Monroe.
Thornburg, Mark G.,	A. H.,	Ames,	Story.
Thornton, H. L.,	A. H.,	Millersburg,	Iowa.
Tracy, Frank E.,	A. H.,	Nashua,	Chickasaw.
Trullinger, Robert,	C. E.,	Farragut,	Fremont.
Van Meter, Murro E.,	E. E.,	Manilla,	Crawford.
Van Slyke, Fred C.,	C. E.,	Mitchellville,	Polk.
Waggoner, Jacob E.,	A. E.,	Primghar,	O'Brien.
Wagner, H. W.,	E. E.,	Calamus,	Ringgold.
Wakefield, Helen,	D. E.,	Sioux City,	Woodbury.
Walker, H. B.,	C. E.,	Des Moines,	Polk.
Wallace, Henry A.,	A. H.,	Des Moines,	Polk.
Watts, Helen L.,	D. E.,	Ames,	Story.
Wells, Walter T.,	E. E.,	Marathon,	Buena Vista.
Wentworth, W. A.,	Agron.,	State Center,	Marshall.
Wettengel, Frank,	E. E.,	Dunlap,	Harrison.
Whalen, William T.,	E. E.,	Boone,	Boone.
White, Myrle,	Sci.,	Ames,	Story.
White, Ross,	C. E.,	Bagley,	Guthrie.
Winslow, L. M.,	A. H.,	Ames,	Story.
Wood, J. R.,	M. E.,	Ames,	Story.
Yocum, J. R.,	E. E.,	Des Moines,	Polk.
Yeomans, Homer C.,	M. E.,	Ames,	Story.

Total, 208.

JUNIORS.

NAME	COURSE	TOWN	COUNTY
Ames, John H.,	C. E.,	Knoxville,	Marion.
Amondson, Owen L.,	M. E.,	Dows,	Wright.
Anderson, May,	D. E.,	Ames,	Story.
Apple, Alfred B.,	E. E.,	Rock Rapids,	Lyon.
Arnold, Maude,	Sci.,	Ames,	Story.

Arthur, Charles S.,	C. E.,	Ames,	Story.
Athanasiou, Basil,	Agron.,	Belgrad,	*Russia.*
Baker, A. G.,	C. E.,	Eldora,	Hardin.
Baker, Osmon D.,	A. H.,	Edmund,	*Wisconsin.*
Baldwin, W. H.,	M. E.,	Braddyville,	Page.
Barrett, Robert L.,	Hort.,	Osage,	Mitchell.
Barry, Russell J.,	E. E.,	Cedar Rapids,	Linn.
Bashford, Louis G.,	C. E.,	Clarksville,	Butler.
Baxter, Robert B.,	A. H.,	Galva,	Ida.
Beardshear, Charles,	Dairy,	Ames,	Story.
Beardshear, William M.,	Sci.,	Ames,	Story.
Beinhart, E. G.,	A. H.,	Ames,	Story.
Beitel, A. H.,	M. E.,	Ames,	Story.
Beiter, Grover,	C. E.,	Carroll,	Carroll.
Benbow, Fred,	E. E.,	Ames,	Story.
Benson, Arthur W.,	C. E.,	Des Moines,	Polk.
Beresford, Rex,	A. H.,	Vinton,	Benton.
Bergen, Hanson,	Sci.,	Dubuque,	Dubuque.
Bevins, Noel,	Vet.,	Hawkeye,	Fayette.
Blackburn, J. Raymond,	A. H.,	Royal,	*Nebraska.*
Blair, James R.,	C. E.,	Ames,	Story.
Bornn, A. L.,	Vet.,	Story City,	Story.
Brennan, Regina,	D. E.,	McGregor,	Clayton.
Bristol, Fred T.,	C. E.,	Des Moines,	Polk.
Brown, E. H.,	C. E.,	Albert Lea,	*Minnesota.*
Brown, Joe D.,	E. E.,	Sioux City,	Woodbury.
Brown, Roy E.,	Vet.,	Ames,	Story.
Brown, Seth A.,	E. E.,	Manchester,	Delaware .
Brush, George,	E. E.,	Traer,	Tama.
Buck, Floyd L.,	Vet.,	Ames,	Story.
Buckland, Wm. W.,	A. H.,	Ames,	Story.
Burgeson, J. A.,	E. E.,	Ames,	Story.
Burkhalter, Carl S.,	C. E.,	Ames,	Story.
Burling, Helen A.,	Sci.,	Eldora,	Hardin.
Cameron, Hurst M.,	Vet.,	Montezuma,	Poweshiek.
Cameron, Will D.,	E. E.,	Ames,	Story.
Capper, Chas.,	C. E.,	Ames,	Story.
Cassady, E. M.,	A. H.,	Whiting,	Monona.
Chalmers, David J.,	Vet.,	Corning,	Adams.
Chapman, Evan A.,	Sci.,	Randolph,	*Nebraska.*
Clapper, Lyle,	C. E.,	Ames,	Story.
Clark, Clarissa,	Sci.,	Ames,	Story.
Clark, Giles W.,	M. E.,	Cedar Rapids,	Linn.
Cockerell, B. Fred,	C. E.,	Harlan,	Shelby.
Cooley, Clark H.,	E. E.,	Manchester,	Delaware.
Cort, Edwin G.,	A. H.,	Ames,	Story.
Cupps, Ethel,	Sci.,	Ames,	Story.
Darger, Harry C.,	A. H.,	Sioux City,	Woodbury.
Davenport, Will,	A. H.,	Odebolt,	Sac.
Davidson, Rexford J.,	A. H.,	Brooklyn,	Poweshiek.
Davis, Edward C.,	A. H.,	Hedrick,	Keokuk.
Davis, Orrin L.,	C. E.,	New Virginia,	Warren.
Deacon, Elizabeth,	Sci.,	Ames,	Story.
Deemer, Edward,	A. H.,	Des Moines,	Polk.
Deemer, Elizabeth,	Sci.,	Des Moines,	Polk.
Dickey, Walter N.,	M. E.,	Cedar Falls,	Blackhawk.
Dodds, John S.,	C. E.,	Mankato,	*Minnesota.*
Doerr, John,	Vet.,	Baxter,	Jasper.
Dornbach, W. E.,	Cer.,	McGregor,	Clayton.

Doughty, L. H.,	C. E.,	Norfolk,	*Nebraska.*
Dowson, Harry R.,	M. E.,	Columbus Jct.,	Louisa.
DuVal, Eugene,	M. E.,	Glenwood,	Mills.
Eastwold, O. A.,	E. E.,	Le Roy,	*Minnesota.*
Edgecomb, Rex E.,	C. E.,	Missouri Valley,	Harrison.
Eichling, H. L.,	Agron.,	Ames,	Story.
Elayda, Inocencio,	Agron.,	Iba,	*Zambeles, P. I.*
Elliott, W. R.,	Vet.,	Woodward,	Dallas.
Evans, E. Loyd,	M. E.,	Linn Grove,	Buena Vista.
Farnsworth, E. P.,	Dairy,	Avoca,	Pottawattamie.
Ferguson, Myrtle,	D. E.,	Sioux City,	Woodbury.
Ferm, John F.,	M. E.,	Lead,	*South Dakota.*
Fiester, Archie,	E. E.,	Independence,	Buchanan.
Fisher, Austin J.,	C. E.,	Glidden,	Carroll.
Freed, Oscar,	Vet.,	Ames,	Story.
Freeman, Frank G.,	Hort.,	Winfield,	Henry.
Frevert, Carl B.,	M. E.,	Odebolt,	Sac.
Fuller, J. M.,	Dairy,	Ames,	Story.
Gardner, W. Miles,	A. H.,	Audubon,	Audubon.
Gibson, E. P.,	E. E.,	Harlan,	Shelby.
Gilchrist, Margaret,	Sci.,	Ames,	Story.
Gilmore, Claude B.,	E. E.,	Phillips,	*Nebraska.*
Gobble, Carl F.,	A. H.,	Fairfield,	Jefferson.
Goodin, Charles,	C. E.,	Des Moines,	Polk.
Graham, Charles H.,	A. H.,	Ames,	Story.
Greer, J. R.,	Mn. E.,	Marion,	Linn.
Gregg, R. M.,	A. H.,	Hawarden,	Sioux.
Haas, Franz J.,	Agron.,	Shelby,	Shelby.
Handy, Don J.,	Dairy,	Grinnell,	Poweshiek.
Hanson, Bert B.,	C. E.,	Stacyville,	Mitchell.
Hardman, C. J.,	A. H.,	Commerce,	*Georgia.*
Harter, Ira,	M. E.,	Sac City,	Sac.
Hatch, Frank E.,	A. H.,	Sumner,	Bremer.
Hatch, H. C.,	E. E.,	George,	Lyon.
Havner, Harry,	Vet.,	Corydon,	Wayne.
Heiple, Eldridge,	C. E.,	Waterloo,	Blackhawk.
Hendricks, C. W.,	Agron.,	Muscatine,	Muscatine.
Hill, A. F.,	M. E.,	Ames,	Story.
Hill, Frank W.,	C. E.,	Osage,	Mitchell.
Hintgen, L. N.,	C. E.,	Ashton,	Osceola.
Hoffman, Arthur F.,	Hort.,	Des Moines,	Polk.
Hoffman, George C.,	C. E.,	Livermore,	Humboldt.
Holcomb, F. L.,	A. H.,	Southern Pines,	*North Carolina.*
Horcasitas, Fernando,	Agron.,	Chihuahua,	*Mexico.*
Householder, Harold,	Vet.,	Chariton,	Lucas.
Howd, Otto,	C. E.,	Webster City,	Hamilton.
Howes, Ray L.,	M. E.,	Clinton,	Clinton.
Hoyt, Samuel H.,	C. E.,	Mason City,	Cerro Gordo.
Hunt, Edith,	D. E.,	Ackley,	Hardin.
Hurd, R. R.,	C. E.,	Williams,	Hamilton.
Hutcheson, C. E.,	Dairy,	De Soto,	Dallas.
Jensen, Gene J.,	E. E.,	Maquoketa,	Jackson.
Johnson, Bernard,	Vet.,	Sweetwater,	*Nebraska.*
Johnson, Roy C.,	E. E.,	Hawarden,	Sioux.
Jones, R. Glenn,	Dairy,	Marion,	Linn.
Jones, Margaret,	D. E.,	Manchester,	Delaware.
Kamerer, N. C.,	M. E.,	Ft. Madison,	Lee.
Kelley, J. B.,	M. E.,	Ames,	Story.
Kelley, M. A. Raymond,	M. E.,	Ames,	Story.

Kendall, Rex W.,	M. E.,	Ames,	Story.
Kierulff, W. Karl,	E. E.,	Montezuma,	Poweshiek.
Killey, J. W.,	C. E.,	Perry,	Dallas.
Klippel, F. H.,	E. E.,	Britt,	Hancock.
Kyner, Roy E.,	Vet.,	Humeston,	Wayne.
Laing, Frank O.,	C. E.,	Grinnell,	Poweshiek.
Laird, W. R.,	Vet.,	Algona,	Kossuth.
Lake, C. C.,	A. H.,	Gilbert Station,	Story.
Lamb, Eleanor M.,	D. E.,	Redoth,	*Illinois.*
Lamson, J. B.,	Agron.,	Fairfield,	Jefferson.
LaSourd, G. M.,	M. E.,	Woodbine,	Harrison.
Lattimer, B. J.,	Vet.,	Bancroft,	Kossuth.
Lee, LaVerne,	Sci. & Agr.,	Sac City,	Sac.
Leerburg, N.,	M. E.,	Marshalltown,	Marshall.
Lemmon, George R.,	C. E.,	Atlantic,	Cass.
Leonard, Arthur C.,	M. E.,	Elliott,	Montgomery.
Linse, J. F.,	Vet.,	Ames,	Story.
Long, George J.,	E. E.,	Thornton,	Cerro Gordo.
Lovesee, Roscoe G.,	Vet.,	Storm Lake,	Buena Vista.
Luney, E. A.,	E. E.,	Denison,	Crawford.
Macklin, Theodore,	Dairy,	Ames,	Story.
Madsen, Sern,	M. E.,	Ames,	Story.
Maine, Harry E.,	Mn. E.,	Des Moines,	Polk.
Malloy, John M.,	C. E.,	Davenport,	Scott.
Manautou, Gregorio,	Agron.,	Arroyo,	*Porto Rico.*
Mann, Floyd D.,	Agron.,	Castana,	Monona.
Mantor, M. Inez,	D. E.,	Ames,	Story.
Marks, W. H.,	Vet.,	Lake Park,	Dickinson.
Martin, Carlton E.,	C. E.,	Des Moines,	Polk.
Martin, E. R.,	E. E.,	Wayland,	Henry.
Martin, Helen,	Sci.,	Newton,	Jasper.
Mayhew, Harry,	A. H.,	Villisca,	Montgomery.
Mercer, F. H.,	A. H.,	Elliott,	Montgomery.
Merrill, A. H.,	C. E.,	Livermore,	Humboldt.
Michaelson, Thorvald,	C. E.,	Cedar Falls,	Blackhawk.
Middleton, R. S.,	Dairy,	Minerva,	Marshall.
Miller, Paul E.,	Agron.,	Cedar Rapids,	Linn.
Mills, Vera,	Sci.,	Jefferson,	Greene.
Mobley, Byers,	M. E.,	Oskaloosa,	Mahaska.
Morris, F. H.,	M. E.,	Corning,	Adams.
Mosher, Clark L.,	C. E.,	West Liberty,	Muscatine.
Moss, Verne W.,	E. E.,	Albia,	Monroe.
Musgrove, F. B.,	M. E.,	Ames,	Story.
McCall, F. E.,	Hort.,	Ames,	Story.
McCartney, H. E.,	A. H.,	Geneva,	*Nebraska.*
McCormick, A. G.,	A. H.,	Mt. Pleasant,	Henry.
McCoy, Edwin,	M. E.,	Creston,	Union.
McCulloch, H.,	Vet.,	Donnellson,	Lee.
McCune, Charles E.,	E. E.,	Davenport,	Scott.
McDonald, Murl,	Agron.,	Ames,	Story.
McElyea, L. W.,	Vet.,	Ames,	Story.
McFarland, F. M.,	E. E.,	Harlan,	Shelby.
McMillan, J. G.,	Agron.,	Vinton,	Benton.
McRoberts, Hilton,	Vet.,	Columbus City,	Louisa.
Naiden, J. H.,	M. E.,	Woodward,	Dallas.
Narvis, C. Stewart,	M. E.,	Muscatine,	Muscatine.
Naylor, Joe S.,	Agron.,	Clear Lake,	Cerro Gordo.
Neil, James E.,	Agron.,	Long Grove,	Scott.
Nelson, N. Louis,	Vet.,	Algona,	Kossuth.

Palmer, Berte L.,	E. E.,	Algona,	Kossuth.
Palmer, D. B.,	Vet.,	Cedar Rapids,	Linn.
Palmer, Roy C.,	Agron.,	Eddyville,	Wapello.
Parke, L. S.,	Hort.,	Paullina,	O'Brien.
Parker, B. L.,	E. E.,	Moscow,	Muscatine.
Paulsen, H. J.,	M. E.,	Avoca,	Pottawattamie.
Peterson, Chester A.,	M. E.,	Slater,	Story.
Peterson, George E.,	C. E.,	Harlan,	Shelby.
Platts, Charles,	Agron.,	Lake Mills,	Winnebago.
Porterfield, Ray S.,	Vet.,	Hartley,	O'Brien.
Pusch, George W.,	M. E.,	Tucson,	*Arizona.*
Quinn, Allen A.,	Agron.,	Mantua,	*Ohio.*
Quint, Annie,	Sci.,	Des Moines,	Polk.
Raasch, Fred A.,	E. E.,	Rockford,	Floyd.
Rector, John U.,	A. H.,	Oneida,	Delaware.
Reppert, Phil L.,	M. E.,	Cumberland,	Cass.
Reynoldson, L. R. A.,	Hort.,	Primghar,	O'Brien.
Richmond, R. R.,	A. H.,	Bancroft,	Kossuth.
Ricketts, R. A.,	Vet.,	Ames,	Story.
Robinson, Frank A.,	Mn. E.,	Colfax,	Jasper.
Rogers, Harold,	C. E.,	Toledo,	Tama.
Rohwer, Alfred,	E. E.,	Denison,	Crawford.
Root, Walter H.,	C. E.,	Des Moines,	Polk.
Rush, Gladys,	Sci.,	Ames,	Story.
Sauerberg, C. G.,	M. E.,	Mason City,	Cerro Gordo.
Schafer, Charles W.,	C. E.,	Grinnell,	Poweshiek.
Schmitt, Walter W.,	Agron.,	Niagara Falls,	*New York.*
Schoenenberger, J. G.,	Vet.,	East Peru,	Madison.
Schregardus, Dirk,	E. E.,	Prairie City,	Jasper.
Scott, Floyd A.,	Vet.,	Ontario,	Story.
Searle, Jessie,	Hort.,	Nemaha,	Sac.
Shields, Fred W.,	A. H.,	Villisca,	Montgomery.
Shiffer, James A.,	M. E.,	Tipton,	Cedar.
Simmons, Paul M.,	C. E.,	Osceola,	Clarke.
Slater, Charles Victor,	C. E.,	Ames,	Story.
Smith, Percy T.,	Hort.,	Ames,	Story.
Smith, Wm. Armstrong,	C. E.,	Eagle Grove,	Wright.
Smith, Warren T.,	C. E.,	Ames,	Story.
Stafford, Ray,	E. E.,	Ames,	Story.
Steel, Byram W.,	C. E.,	Winterset,	Madison.
Stephens, Marie,	D. E.,	Lohrville,	Calhoun.
Stewart, Burt A.,	Agron.,	Marshalltown,	Marshall.
Stewart, Benjamin J.,	E. E.,	Davenport,	Scott.
Stewart, James E.,	C. E.,	Eldon,	Wapello.
Stoulil, W. G.,	C. E.,	Pocahontas,	Pocahontas.
Tellier, Emma,	D. E.,	Humboldt,	Humboldt.
Thompson, J. Irwin,	A. H.,	Jamaica,	Guthrie.
Thornburg, Earl,	E. E.,	Linden,	Dallas.
Tolstrup, M. R.,	Dairy,	Ames,	Story.
Tompkin, Willie I.,	E. E.,	Garrison,	Benton.
Trimble, Charles S.,	Dairy,	Clarinda,	Page.
Vail, Howard O.,	A. H.,	Nevada,	Story.
Van Auken, E. W.,	Mn. E.,	Ames,	Story.
Vaughn, Howard,	A. H.,	Marion,	Linn.
Velie, Carlton E.,	E. E.,	Sanborn,	O'Brien.
Vorse, Charles S.,	C. E.,	Des Moines,	Polk.
Walker, Boyd A.,	C. E.,	Des Moines,	Polk.
Walraven, John,	E. E.,	Lyons,	Clinton.
Walter, Ralph E.,	E. E.,	Harlan,	Shelby.

Waterman, Charles R.,	E. E.,	Newell,	Buena Vista.
Watson, Wallace S.	C. E.,	Greene,	Butler.
Weiss, Albert,	A. H.,	Denison,	Crawford.
Wells, Clark J.,	E. E.,	Ireton,	Sioux.
White, S. K.,	Hort.,	Ames,	Story.
Whitham, J. C.,	Hort.,	Fairfield,	Jefferson.
Wichman, George,	E. E.,	Atlantic,	Cass.
Wilbur, William E.,	C. E.,	Omaha,	*Nebraska.*
Willey, L. E.,	Vet.,	Ames,	Story.
Winchell, J. Ira,	M. E.,	Anita,	Cass.
Woodman, Arthur,	C. E.,	Russell,	Lucas.
Woody, C. C.,	C. E ,	Ames,	Story.
Wright, Charles E.,	C. E.,	Ames,	Story.
Wylie, Paul E.,	C. E.,	Des Moines,	Polk.
Young, G. H.,	Agron.,	Des Moines,	Polk.
Zentmire, Zelma	Sci.,	Ames,	Story.
Zimmerman, A. G.,	Agron.,	Washta,	Cherokee.

Total, 258.

SOPHOMORES.

NAME	COURSE	TOWN	COUNTY
Abramson, John,	C. E.,	Morning Sun,	Louisa
Adams, David,	C. E.,	Oakes,	*North Dakota.*
Ahlbrecht, Louise,	D. E.,	Tama,	Tama.
Akeson, Roy P.,	A. H.,	Council Bluffs,	Pottawattamie.
Alexander, Philip,	E. E.,	Guthrie Center,	Guthrie.
Allinson, Charles J.,	A. H.,	Hampton,	Franklin.
Amborn, Rolla,	M. E.,	Fort Madison,	Lee.
Ames, John B.,	A. H.,	Conrad,	Grundy.
Amesbury, Ernest,	C. E ,	Missouri Valley,	Harrison.
Anderson, A. G.,	C. E.,	Des Moines,	Polk.
Anderson, John W.,	E. E.,	Sioux City,	Woodbury.
Arentson, James,	M. E.,	Harlan,	Shelby.
Arthur, Joseph N.,	C. E.,	Ames,	Story.
Banks, C. H.,	Vet.,	Ames,	Story.
Barrett, Ruth D.,	Sci.,	Ames,	Story.
Barrick, E. T.,	A. H.,	Sheldon,	O'Brien.
Bass, Elmer A.,	A. H.,	Emerson,	Mills.
Bass, Howard L.,	A. H.,	Red Oak,	Montgomery.
Baughman, John,	Vet.,	Ames,	Story.
Baxter, Sam,	A. H.,	Buckingham,	Tama.
Beaty, Floyd,	E. E.,	Dana,	Greene.
Beckman, Henry C.,	C. E.,	Muscatine,	Muscatine.
Bell, E. M.,	A. H.,	Wiota,	Cass.
Bell, R. A.,	Agron.,	Sumner,	Bremer.
Beverly, A. L.,	Vet.,	Ames,	Story.
Bigelow, Herbert,	E. E.,	Waukon,	Allamakee.
Biller, Minnie	D. E.,	Hartington,	*Nebraska.*
Bird, Byron,	C. E.,	Duncombe,	Webster.
Bird, Paul,	Mn. E.,	Ames,	Story.
Blinn, Ray Elmer,	M. E.,	Ames,	Story.
Blunt, Grover,	C. E.,	West Union,	Fayette.
Boden, F. O.,	C. E.,	Ames,	Story.
Bosman, G. J.,	Agron.,	Kraolkop,	*Transvaal, S. A.*
Brady, Ezra M.,	Vet.,	Sanborn,	O'Brien.
Brooks, E. C.,	E. E.,	Wiota,	Cass.
Brown, Arthur F.,	A. H.,	Jefferson,	Greene.

Brown, Carrie,	D. E.,	Ames,	Story.
Brown, Roy G.,	Vet.,	Ames,	Story.
Brumhall, J. H.,	E. E.,	Armstrong,	Emmet.
Buckley, Warren,	Agron.,	Highland Park,	*Illinois.*
Buckman, A. W.,	Cer.,	Calamus,	Clinton.
Burge, Charles,	Agric.,	Mt. Vernon,	Linn.
Burket, LeRoy K.,	E. E.,	Hawarden,	Sioux.
Burlingame, H. Homer,	M. E.,	Cherokee,	Cherokee.
Bysom, Leslie L.,	E. E.,	Primghar,	O'Brien.
Cairy, Forest,	Vet.,	Algona,	Kossuth.
Caldwell, Florence,	D. E.,	Ames,	Story.
Campbell, Arthur L.,	M. E.,	Park Rapids,	*Minnesota.*
Carpenter, Clinton C.,	Cer.,	Marion,	Linn.
Carpenter, Charles P.,	Agron.,	Clear Lake,	Cerro Gordo.
Cathcart, Chat S.,	Ag. E.,	Lohrville,	Calhoun.
Chappel, Allen R.,	A. H.,	Des Moines,	Polk.
Clark, Faye E.,	Sci.,	Humboldt,	Humboldt.
Clark, Hal B.,	Hort.,	Sioux City,	Woodbury.
Clarkson, LeRoy J.,	E. E.,	Albia,	Monroe.
Clemmer, H. F.,	C. E.,	Hampton,	Franklin.
Clyde, Flora H.,	D. E.,	Osage,	Mitchell.
Collins, James V.,	E. E.,	Winthrop,	Buchanan.
Colvin, Robert C.,	Mn. E.,	Ames,	Story.
Conlee, Glen,	E. E.,	Lehigh,	Webster.
Cooper, Morton O.,	A. H.,	Knierim,	Calhoun.
Coverdale, Roy E.,	A. H.,	Maquoketa,	Jackson.
Craft, Ira C.,	C. E.,	Zearing,	Story.
Creel, Salvador,	Agron.,	Chihuahua,	*Mexico.*
Cressler, Merritt,	C. E.,	Scranton,	Greene.
Cronin, Leo J.,	Hort.,	Sibley,	Osceola.
Cronin, Maurice J.,	A. H.,	Sibley,	Osceola.
Crow, H. O.,	Mn. E.,	Eldon,	Wapello.
Culp, Opal,	D. E.,	Ames,	Story.
Cunning, Harold R.,	Mn. E.,	Clinton,	Clinton.
Cutler, Ed. C.,	M. E.,	Farragut,	Fremont.
Davis, Elizabeth A.,	D. E.,	Sutherland,	O'Brien.
Davis, Harry E.,	5 yr. E. E.,	Hampton,	Franklin.
Day, Roy M.,	Dairy,	Minneapolis,	*Minnesota.*
Dean, Caroline,	D. E.,	Nevada,	Story.
Dean, Myrtle,	D. E.,	New Richmond,	*Wisconsin.*
DeKay, Earle,	E. E.,	Ames,	Story.
Doggatt, A. E.,	A. H.,	Ames,	Story.
Dorchester, Charles,	Agron.,	Clear Lake,	Cerro Gordo.
Doty, Hiram S.,	Sci.,	Ames,	Story.
Drennan, Stella,	Sci.,	Mt. Etna,	Adams.
Drew, L. Paul,	C. E.,	Ames,	Story.
Dunlop, A. N.,	A. H.,	Fort Dodge,	Webster.
Dunlop, George,	Agron.,	Jefferson,	Greene.
Dyer, Winthrop K.,	Agric.,	Nevada,	Story.
Easter, Mary,	D. E.,	Bonaparte,	Van Buren.
Egloff, J. M.,	A. H.,	Cedar Falls,	Blackhawk.
Elliott, Frank,	A. H.,	Sioux City,	Woodbury.
Emerson, J. Gordon	Sci.,	Burchinal,	Cerro Gordo.
Fain, Olive E.,	D. E.,	Chariton,	Lucas.
Farnsworth, Elizabeth,	D. E.,	Boone,	Boone.
Fedderson, Paul C.,	Mn. E.,	Bryant,	Clinton.
Fensler, Harry M.,	C. E.,	Missouri Valley,	Harrison.
Ferrand, Wm. S.,	Vet.,	Ames,	Story.
Ferriols, Vicente,	Vet.,	San Marcentino,	*Zambales. P. I.*

Finch, A. D.,	C. E.,	West Union,	Fayette.
Fischer, Edward L.,	E. E.,	Ames,	Story.
Flint, Helen,	D. E.,	Ames,	Story.
Flint, Victor,	A. H.,	Nashua,	Chickasaw.
Folkins, G. H.,	Vet.,	Ames,	Story.
Fowler, Arthur E.,	M. E.,	Cedar Rapids,	Linn.
Frances, Leslie L.,	E. E.,	Manson,	Calhoun.
Freed, W. J,.	Agron.,	Kelley,	Story.
Friedman, Victor N.,	E. E.,	Sioux City,	Woodbury.
Frommelt, Horace,	E. E.,	Dubuque,	Dubuque.
Furman, Russel A.,	C. E.,	Lyons,	Clinton.
Fuchs, Iva,	D. E.,	Early,	Sac.
Fulton, Robert,	Dairy,	Storm Lake,	Buena Vista.
Gaden, Henry,	C. E.,	Remsen,	Plymouth.
Garabrant, Howard,	Agron.,	Chester,	*New Jersey.*
Gaston, Mildred,	D. E.,	Boone,	Boone.
Gaylord, R. W.,	C. E.,	Grinnell,	Poweshiek.
Gibson, Andrew D.,	E. E.,	Ames,	Story.
Gilles, DeWitt C.,	Vet.,	Stacyville,	Mitchell.
Gillette, Lester S.,	A. H.,	Fostoria,	Clay.
Gillmor, I. F.,	A. H.,	Dixon,	Scott.
Gilmore, Earl,	Vet.,	Ames,	Story.
Gjellefald, Olaf,	C. E.,	Forest City,	Winnebago.
Good, Harry F.,	E. E.,	Ames,	Story.
Goodrich, Ira E.,	C. E.,	Waterloo,	Blackhawk.
Gratiot, Joseph B.,	A. H.,	Shullsburg,	*Wisconsin.*
Gray, Margaret,	D. E.,	Ames,	Story.
Gregg, Ralph W.,	Agron.,	Hawarden,	Sioux.
Group, Jessie,	E. E.,	Ames,	Story.
Haberkorn, Julien B.,	A. H.,	Cherokee,	Cherokee.
Hadley, M. B.,	Mn. E.,	Ames,	Story.
Hall, Harry W.,	Vet.,	West Liberty,	Muscatine.
Halverson, Hilmer,	C. E.,	Kingsley,	Plymouth.
Hamilton, Sherman,	M. E.,	Lead,	*South Dakota.*
Hammond, F. B.,	Dairy,	Ames,	Story.
Hampton, Maggie,	D. E.,	Coon Rapids,	Carroll.
Hanchette, Ralph,	C. E.,	Sioux City,	Woodbury.
Hancock, Mabel,	D. E.,	Clarion,	Wright.
Hansell, Hortense C.,	Sci.,	Ottumwa,	Wapello.
Hanson, Irvin,	E. E.,	Estherville,	Emmet.
Harris, Rosalie,	D. E.,	Fairfield,	Jefferson.
Hartnell, Fred E.,	A. H.,	Stacyville,	Mitchell.
Hartung, A. E.,	E. E.,	Estherville,	Emmet.
Hassell, W. Claire,	Hort.,	Cedar Rapids,	Linn.
Hathaway, Ina,	D. E.,	Webster City,	Hamilton.
Haw, A. B.,	E. E.,	Ottumwa,	Wapello.
Hawthorne, H. B.,	Agron.,	Castana,	Monona.
Helm, Ralph,	Agron.,	Des Moines,	Polk.
Hess, Arthur W.,	Mn. E.,	Lyons,	Clinton.
Hill, T. John,	Sci.,	Cambridge,	Story.
Hise, Fred H.,	M. E.,	Monroe,	Jasper.
Hitchings, Charles,	A. H.,	Sutherland,	O'Brien.
Hites, Edwin E.,	Vet.,	Des Moines,	Polk.
Holloway, G. N.,	E. E.,	Mason City,	Cerro Gordo.
Hook, M. Glenn,	M. E.,	Humboldt,	Humboldt.
Horn, Walter L.,	A. H.,	Newton,	Jasper.
Horcasitas, P.,	A. H.,	Chihuahua,	*Mexico.*
Horton, Guy,	Mn. E.,	Marion,	Linn.
Hough, Herbert S.,	A. H.,	Chicago,	*Illinois.*

Houghton, Glenn B.,	Agron.,	Hedrick,	Keokuk.
Howard, Allen B.,	M. E.,	Ft. Madison,	Lee.
Howe, Alice R.,	D. E.,	Cedar Rapids,	Linn.
Hoyt, Edward L.,	M. E.,	Omaha,	*Nebraska.*
Hudson, C. Ross,	E. E.,	Ames,	Story.
Hunter, Carrie,	D. E.,	Ames,	Story.
Hurst, R. L.,	Mn. E.,	Leon,	Decatur.
Hutchinson, Clarion B.,	E. E.,	De Soto,	Dallas.
Hynes, B. C.,	Cer.,	Shenandoah,	Page.
Hyzer, Albert,	Dairy,	Ames,	Story.
Illeman, John A.,	C. E.,	Charlotte,	Clinton.
Johnson, Floyd L.,	Agron.,	Boone,	Boone.
Johnson, Frank B.,	E. E.,	Wall Lake,	Sac.
Jones, John J.,	Mn. E.,	Ida Grove,	Ida.
Jones, Marion E.,	A. H.,	Hamlin,	Audubon.
Jones, Will E.,	C. E.,	Sturgis,	*South Dakota.*
Keeney, W. E.,	C. E.,	Jefferson,	Greene.
Keipp, Harry M.,	A. H.,	Colfax,	Jasper.
Kelleher, John Joseph,	A. H.,	Des Moines,	Polk.
Kerrigan, John C.,	C. E.,	Davenport,	Scott.
King, Jessie B.,	D. E.,	Colorado Springs,	*Colorado.*
King, Ruth E.,	Sci.,	Ames,	Story.
Knight, Everett F.,	E. E.,	Eldon,	Wapello.
Knutz, Will H.,	E. E.,	Moville,	Woodbury.
Koepke, W. C.,	Hort.,	Davenport,	Scott.
Koolish, Phillip H.,	E. E.,	Sioux City,	Woodbury.
Krause, Franz F. E.,	Agron.,	Ionia,	Chickasaw.
Kuempel, Reuben,	M. E.,	Guttenberg,	Clayton.
Laird, Ralph J.,	Vet.,	Algona,	Kossuth.
Layman, Claude C.,	A. H.,	Ames,	Story.
Lessel, Leonard,	Agron.,	Perry,	Dallas.
Leiser, Harold,	E. E.,	Alden,	Hardin.
Lindaman, Harvey,	M. E.,	Charles City,	Floyd.
Lippencott, W. A.,	A. H.,	Ames,	Story.
Little, Roy L.,	A. H.,	Cherokee,	Cherokee.
Livingstone, Thos. M.,	E. E.,	Monroe,	Jasper.
Logan, Clifton C.,	Vet.,	Hillsboro,	Henry.
Long, Fred R.,	A. H.,	Marne,	Cass.
Loomis, George A.,	Mn. E.,	Cherokee,	Cherokee.
Louck, Rex,	Vet.,	Kalona,	Washington.
Luithly, Wm. E.,	Vet.,	Ames,	Story.
Lynde, Alice,	D. E.,	Hartington,	*Nebraska.*
Macomb, R. L.,	A. H.,	Paullina,	O'Brien.
Maney, T. J.,	Hort.,	Ames,	Story.
Mann, Will G.,	E. E.,	Lake Benton,	*Minnesota.*
Manning, T. W.,	Sci.,	Ames,	Story.
Marshall, Clark T.,	A. H.,	Charter Oak,	Crawford.
Martinson, William,	C. E.,	Harlan,	Shelby.
Marvick, Severt,	Agron.,	Story City,	Story.
Mayne, Earl W.,	Vet.,	Sanborn,	O'Brien.
Mead, Rex S.,	E. E.,	Primghar,	O'Brien.
Mellor, Bessie,	D. E.	Ames,	Story.
Mercer, W. Clyde,	E. E.,	Greenfield,	Adair.
Miller, Claude C.,	E. E.,	Renwick,	Humboldt.
Miller, George E.,	A. H.,	Ames,	Story.
Miller, W. J.,	Vet.,	Ames,	Story.
Miner, Leland,	M. E.,	Shell Rock,	Butler.
Molesberry, Howard C.,	C. E.,	Plymouth,	Cerro Gordo.
Montillon, G. H.,	M. E.,	Cedar Rapids,	Linn.

Moore, C. G.,	Vet.,	Elberon,	Tama.
Moran, Raymond,	Hort.,	Clinton,	Clinton.
Moriarity, Clarence,	C. E.,	Loudton,	*South Dakota.*
Mosbo, Edward,	M. E.,	Rembrandt,	Buena Vista.
Moses, T. Rupert,	Agron.,	Oak Park,	*Illinois.*
Myer, Carlton H.,	M. E.,	West Liberty,	Muscatine.
McConnell, R. E.,	E. E.,	Irwin,	Shelby.
McCown, Winfield V.,	C. E.,	Spencer,	Clay.
McDermott, Guy,	M. E.,	Anita,	Cass.
McDonough, Dan,	E. E.,	Osceola,	Clarke.
McElroy, Harold W.,	Dairy,	Newton,	Jasper.
McElroy, Margaret,	Sci.,	Newton,	Jasper.
McGrew, Melvin,	Agron.,	Emerson,	Mills.
McKelvey, Quinten,	Agron.,	Corydon,	Wayne.
McWilliams, Calvin O.,	E. E.,	Sioux City,	Woodbury.
Nason, Everett P.,	E. E.,	Le Roy,	*Minnesota.*
Negaard, Oscar,	M. E.,	Canby,	*Minnesota.*
Nelson, A. E.,	Agron.,	Harlan,	Shelby.
Nemmers, W. P.,	C. E.,	Bancroft,	Kossuth.
Newburger, Morton B.,	Dairy,	St. Joseph,	*Missouri.*
Newsome, Fred W.,	A. H.,	Derby,	Lucas.
Noble, Guy Lee,	Agron.,	State Center,	Marshall.
Nordstrum, Harry M.,	A. H.,	Humboldt,	Humboldt.
O'Bannion, Allen,	Hort.,	Storm Lake,	Buena Vista.
Olmstead, H. H.,	Vet.,	New Hampton,	Chickasaw.
Olmstead, Ralph A.,	Hort.,	Des Moines,	Polk.
Olson, Carl E.,	M. E.,	Red Oak,	Montgomery.
Olson, DeWitt P.,	C. E.,	Sac City,	Sac.
Olsen, G. Chris,	C. E.,	Ellsworth,	Hamilton.
Olson, Wm. A.,	C. E.,	Cambridge,	Story.
O'Neil, Clem J.,	Dairy,	Livermore,	Humboldt.
Overly, F. L.,	Hort.,	Center Junction,	Jones.
Packman, Chloe,	Sci.,	Eagle Grove,	Wright.
Paine, Harry C.,	Vet.,	Algona,	Kossuth.
Paine, Henry Warren,	M. E.,	Eagle Grove,	Wright.
Parmenter, Glee,	Vet.,	Grimes,	Polk.
Patterson, John,	Vet.,	Marion,	Linn.
Paulsen, J. August,	C. E.,	Irwin,	Shelby.
Peshak, Leona,	Sci.,	Osage,	Mitchell.
Pickler, Herbert T.,	Vet.,	Ottumwa,	Wapello.
Pomeroy, S. Loren,	C. E.,	Newton,	Jasper.
Porter, Clyde H.,	A. H.,	Davenport,	Scott.
Porter, Dugald G.,	M. E.,	Davenport,	Scott.
Pritchard, Lloyd,	A. H.,	Garrison,	Benton.
Quaife, Elvin L.,	A. H.,	Ionia,	Chickasaw.
Randolph, Anita,	D. E.,	Tama,	Tama.
Randolph, Gail,	D. E.,	Tama,	Tama.
Reed, Clark L.,	A. H.,	Bradford,	*Illinois.*
Reed, Mae,	D. E.,	Des Moines,	Polk.
Reeves, Esther,	D. E.,	Sibley,	Osceola.
Renne, J. D.,	M. E.,	Eagle Grove,	Wright.
Richmond, Charles A.,	E. E.,	Cedar Rapids,	Linn.
Richmond, Howard H.,	Hort.,	West Union,	Fayette.
Ries, Sabin,	Vet.,	Armstrong,	Emmet.
Rietveld, Harriet,	D. E.,	Pella,	Marion.
Roberts, L. L.,	Vet.,	Zearing,	Story.
Robinson, Clara,	D. E.,	Armstrong,	Emmet.
Rogers, Glenn E.,	A. H.,	Ames,	Story.
Rosencrans, Merle,	C. E.,	Canton,	*South Dakota.*

Rounds, Arvin D.,	C. E.,	Rock Valley,	Sioux.
Rowat, Dave,	A. H.,	Des Moines,	Polk.
Rowat, Thomas,	C. E.,	Des Moines,	Polk.
Russell, Leta L.,	Sci.,	Humboldt,	Humboldt.
Rutledge, Reyburn L.,	A. H.,	Fort Dodge,	Webster.
Sanborn, G. C.,	Mn. E.,	Moville,	Woodbury.
Sawhill, W. H.,	Agron.,	Clarinda,	Page.
Schoel, Fred S.,	C. E.,	Gladbrook,	Tama.
Schumacher, Charles H.,	M. E.,	Clarinda,	Page.
Scott, Roy D.,	E. E.,	Onawa,	Monona.
Scriver, Stewart A.,	Dairy,	Denison,	Crawford.
Searle, Mary,	D. E.,	Nemaha,	Sac.
Sharp, E. P.,	C. E.,	Dow City,	Crawford.
Shearer, Phineas S.,	A. H.,	Marshalltown,	Marshall.
Sheehan, Wm. Mathew,	E. E.,	Des Moines,	Polk.
Shields, Robert W.,	C. E.,	Washington,	Washington.
Shupe, M. W.,	E. E.,	Ames,	Story.
Simmons, Gay,	Vet.,	Ames,	Story.
Simms, W. H.,	A. H.,	Beaman,	Grundy.
Skegg, Ella C.,	D. E.,	Marshalltown,	Marshall.
Smith, A. Lee,	A. H.,	Creston,	Union.
Smith, Fae E.,	E. E.,	Ames,	Story.
Smith, Grace,	D. E.,	Ames,	Story.
Smith, Grace Helen,	D. E.,	Council Bluffs,	Pottawattamie.
Smith, Howard E.,	A. H.,	Whiting,	Monona.
Smullen, George,	M. E.,	Clinton,	Clinton.
Sosa, Hermes A.,	Agron.,	Asuncion,	*Paraguay, S. A.*
Sperry, Donn,	Vet.,	Fayette,	Fayette.
Squyer, A. R.,	M. E.,	Ames,	Story.
Stang, Levi C.,	E. E.,	Le Mars,	Plymouth.
Stearns, Harvey,	M. E.,	Sutherland,	O'Brien.
Steigleder, Charles J.,	C. E.,	Spencer,	Clay.
Stephenson, Jessie L.,	C. E.,	Spencer,	Clay.
Stoddard, Irving W.,	C. E.,	Grinnell,	Poweshiek.
Storm, Shirley S.,	D. E.,	Ames,	Story.
Stott, Earl R.,	M. E.,	Mason City,	Cerro Gordo.
Stott, R. O.,	E. E.,	Mason City,	Cerro Gordo.
Stuntz, Harold R.,	A. H.,	Greene,	Butler.
Suksdorf, C. R.,	Mn. E.,	Davenport,	Scott.
Taylor, Lee,	Mn. E.,	Maquoketa,	Jackson.
Thomas, W. Lynk,	C. E.,	Coon Rapids,	Carroll.
Thompson, D. Clarence,	M. E.,	Marcus,	Cherokee.
Tompkins, Lester,	A. H.,	Garrison,	Benton.
Tong, Boyd,	Mn. E.,	Ames,	Story.
Tong, Edna,	D. E.,	Ames,	Story.
Tuller, Ralph W.,	A. H.,	Postville,	Allamakee.
Tyson, Harry B.,	Mn. E.,	Emmetsburg,	Palo Alto.
Un, Chung C.,	Agron.,	Canton,	*China.*
Vallejos, E. E.,	Agron.,	Asuncion,	*Paraguay, S. A.*
Van Deventer, J. R.,	Agric.,	Hedrick,	Keokuk.
Van Diepen, Jake,	E. E.,	Boyden,	Sioux.
Van Meerten, Elbert J.,	Ag. E.,	Pretoria,	*Transvaal, S. Afr.*
Vincent, R. T.,	M. E.,	Ames,	Story.
Wagner, Kenneth,	C. E.,	Cedar Rapids,	Linn.
Walker, R. K.,	A. H.,	Des Moines,	Polk.
Walkey, F. L.,	Vet.,	Ames,	Story.
Wall, Joe F.,	Vet.,	Berwick,	Polk.
Walton, S. F.,	Cer.,	Washington,	Washington.
Weaver, Ethel Mae,	D. E.,	Spencer,	Clay,

Webster, Hugh,	A. H.,	Weatherford,	*Oklahoma.*
Welden, Ernest Z.,	C. E.,	Iowa Falls,	Hardin.
Welty, Donald C.,	Hort.,	Chicago,	*Illinois.*
Wendt, Wm. C. R.,	C. E.,	Newton,	Jasper.
Wennholz, Emma S.,	Sci.,	Dundee,	*Illinois.*
Wentch, Margaret,	Sci.,	Dows,	Wright.
Wentsel, Claude,	Agron.,	Beaman,	Grundy.
Whitaker, W. S.,	Agron.,	Hillsboro,	Henry.
White, Warren G.,	C. E.,	Nevada,	Story.
Whitehead, Herbert H.,	A. H.,	La Grange,	*Illinois.*
Whitehouse, Isaac,	M. E.,	Cherokee,	Cherokee.
Whitney, Roy,	Hort.,	Hampton,	Franklin.
Wilkinson, H. Arthur,	E. E.,	Ames,	Story.
Williams, Clarence M.,	Agron.,	E. Las Vegas,	*New Mexico.*
Williams, Hewitt L.,	A. H.,	Postville,	Allamakee.
Williams, Ruth,	D. E.,	Fort Dodge,	Webster.
Wilson, Benjamin B.,	A. H.,	Spencer,	Clay.
Wilson, Maude,	Sci.,	Sac City,	Sac.
Wilson, Osee,	Sci.,	Seymour,	Wayne.
Witwer, Polly,	D. E.,	Cedar Rapids,	Linn.
Wolfe, John,	E. E.,	Keokuk,	Lee.
Woodford, Lawrence G.,	Mn. E.,	Council Bluffs,	Pottawattamie.
Wright, Harry F.,	Mn. E.,	Ames,	Story.
Wright, Jack,	Vet.,	Nephi,	*Utah.*
Wygle, Leonard P.,	Hort.,	Ames,	Story.
Youngdale, Martin,	Agron.,	Harcourt,	Webster.
Zentmire, D.,	Agron.,	Ames,	Story.

Total, 358.

FRESHMEN.

NAME	COURSE	TOWN	COUNTY
Abbott, James T.,	2 yr. Cer.,	Ogden,	*Utah.*
Abram, William A.,	C. E.,	Colfax,	Jasper.
Adams, Neil,	C. E.,	Cambridge,	Story.
Aldrich, Sperry W.,	C. E.,	Guthrie Center,	Guthrie.
Allard, Glenn A.,	E. E.,	Eagle Grove,	Wright.
Allstrand, Harry P.,	M. E.,	Carroll,	Carroll.
Anderson, Albert Victor,	C. E.,	Storm Lake,	Buena Vista.
Angevine, Loch L.	Dairy,	Cambridge,	*Illinois.*
Ankeny, Will,	M. E.,	Des Moines,	Polk.
Arnett, Roy,	C. E.,	Estherville,	Emmet.
Arthur, Edna,	D. E.,	Ames,	Story.
Arthur, Roy,	Agric.,	Spirit Lake,	Dickinson.
Ashby, William W.,	A. E.,	Des Moines,	Polk.
Avery, Elmer E.,	5 yr. E. E.,	Austin,	*Minnesota.*
Avery, Wilbur,	Vet.,	Austin,	*Minnesota.*
Bacon, Frank R.,	Agron.,	Wilton Junction,	Muscatine.
Baenziger, Alfred,	E. E.,	Davenport,	Scott.
Baird, Earl,	A. H.,	Ames,	Story.
Baker, G. W.,	C. E.,	Russell,	Lucas.
Baker, Jason,	E. E.,	Whiting,	Monona.
Ballard, F. S.,	Vet.,	Ames,	Story.
Bark, Margaret Ethel,	Music,	Sutherland,	O'Brien.
Barker, Howard C.,	Agric.,	Winamac,	*Indiana.*
Barker, W. Earl,	C. E.,	Anamosa,	Jones.
Barney, Fay C.,	Agric.,	Hampton,	Franklin.

Bartlett, Bessie,	Sci.,	Estherville,	Emmet.
Batchelder, D. Thomas,	Agric.,	Lyons,	Clinton.
Bean, A. Ray,	E. E.,	Jefferson,	Greene.
Beardshear, James,	C. E.,	Marengo,	Iowa.
Beattie, C. Stewart,	A. H.,	Stuart,	Guthrie.
Beauchamp, Harry E.,	Agric.,	Bedford,	Taylor.
Bechtel, D. G.,	C. E.,	Valley Junction,	Polk.
Bell, H. A.,	Vet.,	Birmingham	Van Buren.
Bennett, Mary,	D. E.,	Cedar Rapids,	Linn.
Benton, E. M.,	A. H.,	Peoria,	*Illinois.*
Berg, H. A.,	E. E.,	Glidden,	Carroll.
Bilstad, Otto,	Agric.,	Joice,	Worth.
Bird, Catherine,	D. E.,	Ames,	Story.
Bisbee, Earl,	Agric.,	Oak Park,	*Illinois.*
Bissell, Elsie K.,	D. E.,	Ottumwa,	Wapello.
Blodgett, Mary,	D. E.,	Mt. Pleasant,	Henry.
Bonner, Gladys,	D. E.,	Jewell,	Hamilton.
Bonsteel, M. W.,	M. E.,	Ames,	Story.
Border, Millard,	Agric.,	Coon Rapids,	Carroll.
Bouck, Damon I.,	E. E.,	Royalton,	*Minnesota.*
Bouton, E. M.,	E. E.,	Royal,	Clay.
Boyack, Geo.,	Agric.,	Grinnell,	Poweshiek.
Boyts, Harry J.,	Agric.,	Kimball,	*South Dakota.*
Bradford, B. L.,	E. E.,	Storm Lake,	Buena Vista.
Bragg, Earl,	M. E.,	Scranton,	Greene.
Brant, Will O.,	A. H.,	Meriden,	Cherokee.
Brasted, Oran,	Agric.,	Grundy Center,	Grundy.
Brouhard, Ora J.,	A. H.,	Colo,	Story.
Brown, David K.,	Agric.,	Harlan,	Shelby.
Brown, Harry,	C. E.,	Sioux City,	Woodbury.
Brown, J. Lloyd,	Agric.,	New Providence,	Hardin.
Brown, Lola Ruth,	Sci.,	Boone,	Boone.
Buckingham, B. F.,	M. E.,	Prairie City,	Jasper.
Burgess, John,	Agric.,	Ottumwa,	Wapello.
Burkhart, Earl,	Mn. E.,	Hawkeye,	Fayette.
Burlingham, Lloyd,	Agric.,	Central City,	Linn.
Burnett, L. E.,	Agric.,	Iowa City,	Johnson.
Butler, Lyle A.,	Mn. E.,	New Providence,	Hardin.
Byers, Jessamine,	Music,	Colo,	Story.
Byrne, W. S.,	E. E.,	Council Bluffs,	Pottawattamie.
Cahow, Ralph,	M. E.,	Greenfield,	Adair.
Calhoun, Glenn,	Agric.,	Bedford,	Taylor.
Campbell, Clyde,	Agric.,	Nashua,	Chickasaw.
Carl, Leslie M.	Agric.,	Lone Tree,	Johnson.
Carson, Wm. L.,	Vet.,	Iowa City,	Johnson.
Chamberlain, Mark,	C. E.,	Des Moines,	Polk.
Chambers, A. B.,	E. E.,	Lake City,	Calhoun.
Chase, Daniel Cady	Sci.,	Webster City,	Hamilton.
Chatburn, Guy,	5 yr. E. E.,	Logan,	Harrison.
Chatterjee, Brahma Nath,	Agric.,	Allahabad,	*India.*
Clapp, Paul,	E. E.,	Adel,	Dallas.
Clark, Clifford King,	Mn. E.,	Algona,	Kossuth.
Clark, George,	Agric.,	Sioux City,	Woodbury.
Clark, Robert J.,	E. E.,	Dakota City,	Humboldt.
Clutter, J. A.,	Dairy,	Newton,	Jasper.
Cochran, Clyde,	Agric.,	Lamoni,	Decatur.
Cochrane, William,	C. E.,	Corning,	Adams.
Coe, Howard S.,	Sci.,	Wooster,	*Ohio.*
Cole, Will H.,	Agric.,	Williams,	Hamilton.

Conlee, Harold E.,	E. E.,	Lehigh,	Webster.
Conover, H. W.,	Vet.,	Ontario,	Story.
Cook, Mabel,	D. E.,	Missouri Valley,	Harrison.
Cool, Irvin,	C. E.,	Waverly,	Bremer.
Corlette, Dean,	Agric.,	Ames,	Story.
Corray, Lawrence E.,	C. E.,	Monroe,	Jasper.
Cosgriff, H. C.,	Agron.,	Clarence,	Cedar.
Cosgrove, Wm. Leo,	E. E.,	Clarence,	Cedar.
Costigan, G. L.,	A. E.,	Ames,	Story.
Coulter, F. M.,	Hort.,	Ames,	Story.
Coykendall, Alice,	D. E.,	Dedham,	Carroll.
Crawford, A. J.,	Mn. E.,	Des Moines,	Polk.
Crocker, Thomas,	Agric.,	Omaha,	*Nebraska.*
Crowley, Orville W.,	C. E.,	Maurice,	Sioux.
Currier, Harold J.,	Agron.,	Salix,	Woodbury.
Cushman, E. A.,	E. E.,	Denison,	Crawford.
Dalbey, D. E.,	Agric.,	Cedar Rapids,	Linn.
Daly, Claude C.,	E. E.,	Newton,	Jasper.
Darbyshire, Glen,	Vet.,	Shannon City,	Union.
Dautremont, Frank,	C. E.,	Monticello,	Jones.
Davenport, Nell,	Music,	Odebolt,	Sac.
Davidson, Ada,	D. E.,	Brooklyn,	Poweshiek.
Deakin, Gail,	Sci.,	Ames,	Story.
Deakin, Helen,	Sci.,	Ames,	Story.
Denniston, Leo,	C. E.,	Collins,	Story.
Dickerson, Ray,	M. E.,	Clinton,	Clinton.
Dickinson, Sherman,	Agric.,	Des Moines,	Polk.
Dickman, Eleanor,	D. E.,	So. Omaha,	*Nebraska.*
Divine, E. R.,	Agric.,	Sycamore,	*Illinois.*
Dixon, Paul W.,	Sci.,	Sac City,	Sac.
Doty, Lewis,	Vet.,	Ames,	Story.
Doty, Lloyd,	Agric.,	Pilger,	*Nebraska.*
Dowell, Jesse M.,	Agric.,	Bedford,	Taylor.
Doyle, B. L.,	Vet ,	Logan,	Harrison.
Drake, Charles P.,	E. E.,	Charter Oak,	Crawford.
Drake, Wm. B.,	M. E.,	Ames,	Story.
Dreibelbis, J. H.,	E. E.,	Scotch Grove,	Jones.
Drennan, Carrie B.,	Music,	Corning,	Adams.
Drips, Will,	Agric.,	Rock Island,	*Illinois.*
Dukes, Charles J.,	Sci.,	Independence,	Buchanan.
Dunn, Russell,	A. H.,	Ames,	Story.
Dunton, Delbert,	A. H.,	Brooklyn,	Poweshiek.
Durey, Earl,	Agric.,	Manchester,	Delaware.
Dysart, Rowen Wayne,	Agric.,	Dysart,	Tama.
Eder, E. O.,	C. E.,	Estherville,	Emmet.
Egert, Benjamin,	M. E.,	Hamburg,	Fremont.
Ellis, Guy S.,	Dairy,	Ames,	Story.
Ellis, Percy,	Vet.,	Ames,	Story.
Ellis, Wayne P.,	M. E.,	Onawa,	Monona.
Eroe, Harold,	E. E.,	Walnut,	Pottawattamie.
Evans, Rudolph M.,	C. E.,	Cedar Rapids,	Linn.
Fahey, William,	C. E.,	Lyons,	Clinton.
Fairall, Walter,	M. E.,	Oskaloosa,	Mahaska.
Fairman, Ray,	E. E.,	Humboldt,	Humboldt.
Fegan, John R.,	M. E.,	Anamosa,	Jones.
Fenton, Faith,	D. E.,	Jewell,	Hamilton.
Ferguson, Howard C.,	Agric.,	Lisbon,	Linn.
Ferguson, Paul,	M. E.,	Shenandoah,	Page.
Feuling, Leonard V.,	Agric.,	Ames,	Story.

Fick, Adolph,	C. E.,	Boone,	Boone.
Finley, Edson L.,	Vet.,	Cedar Falls,	Blackhawk.
Fletcher, Rolland,	Agric.,	Mason City,	Cerro Gordo.
Ford, L. M.,	M. E.,	Cedar Rapids,	Linn.
Frost, Albert,	Agric.,	Grundy Center,	Grundy.
Fry, Gilbert,	Hort.,	Cedar Rapids,	Linn.
Gage, Helen D.,	D. E.	Marion,	Linn.
Gates, Estes N.,	Agric.,	Newton,	Jasper.
Gates, L. S.,	C. E.,	Manchester,	Delaware.
Gatewood, Ray,	Agric.,	Ames,	Story.
Geneser, Jos. Jennings,	E. E.,	Des Moines,	Polk.
Giese, Henry,	E. E.,	Danville,	Des Moines.
Gilchrist, Clifford,	Vet.,	Ontario,	Story.
Gilchrist, David,	C. E.,	Ames,	Story.
Girton, Earl,	Agric.,	State Center,	Marshall.
Glaze, Clifford,	M. E.,	Rockwell City,	Calhoun.
Gleim, Harrie,	Agric.,	Arlington,	Fayette.
Goodbarn, Joe,	C. E.,	Des Moines,	Polk.
Gousself, Vladimer,	A. H.,	Des Moines,	Polk.
Graham, Doliver Wiltsee,	Agric.,	Chicago,	*Illinois.*
Graham, Sappho C.,	Sci.,	Creston,	Union.
Grant, George,	C. E.,	Albia,	Monroe.
Gravatt, Guy,	C. E.,	Traer,	Tama.
Green, Richard C.,	E. E.,	Council Bluffs,	Pottawattamie
Grimes, Anna,	Music,	Ames,	Story.
Groves, Ralph,	Agric.,	Webster City,	Hamilton.
Hackett, Shirley M.,	A. E.,	Sioux City,	Woodbury.
Haggard, Charles H.,	Vet.,	Worthington,	*Minnesota.*
Hagglund, Irene E.,	D. E.,	Essex,	Page.
Hale, Virgil,	M. E.,	Carroll,	Carroll.
Hall, Ora W.,	E. E.,	Ames,	Story.
Hamm, Richard,	C. E.,	Centerville,	Appanoose.
Hanes, Letha,	Sci.,	Humboldt,	Humboldt.
Hanna, Harvey E.,	Agron.,	Manchester,	Delaware.
Hanson, Clara,	D. E.,	Glidden,	Carroll.
Hanson, Marie,	D. E.,	Glidden,	Carroll.
Hardin, Max,	Sci.,	Ames,	Story.
Hardy, Elmer,	E. E.,	Norfolk,	*Nebraska.*
Harlan, Verna Mason,	D. E.,	Hawarden,	Sioux.
Harmon, Guy,	Agric.,	Waterloo,	Blackhawk.
Harpel, Gates,	5 yr. E. E.,	Boone,	Boone.
Harris, Fred,	E. E.,	Des Moines,	Polk.
Harte, E. C.,	M. E.,	Omaha,	*Nebraska.*
Hartgering, J. McRae,	M. E.,	Rapid City,	*South Dakota.*
Hartung, Mary,	D. E.,	Estherville,	Emmet.
Hasty, Cecil,	Vet.,	What Cheer,	Keokuk.
Hathaway, Delwin,	Agric.,	Turin,	Monona.
Hathway, Alonzo,	Agric.,	Webster City,	Hamilton.
Haworth, Robert,	Agric.,	Des Moines,	Polk.
Hayes, Ralph W.,	Agric.,	Clear Lake,	Cerro Gordo.
Helsel, F. V.,	Vet.,	Keosauqua,	Van Buren.
Henninger, Frank E.,	Mn. E.,	Council Bluffs,	Pottawattamie.
Henry, Josephine,	D. E.,	Davenport,	Scott.
Hensel, Rudolph,	Agric.,	Ames,	Story.
Hicken, Rudolph H.,	Agric.,	Peoria,	*Illinois.*
Hill, Carlos V.,	Agric.,	New Sharon,	Mahaska.
Hill, Frank A.,	M. E.,	Rector,	*Virginia.*
Hoff, Carl R.,	A. E.,	Grimes,	Polk.
Holmes, Edwin,	Agric.,	Whiting,	Monona.

Hoopes, Amy,	Music,	Muscatine,	Muscatine.
Hoot, Denver,	E. E.,	Ames,	Story.
Hopkins, Blanche,	D. E.,	Nevada,	Story.
Hopkins, Lynn,	E. E.,	Villisca,	Montgomery.
Hopkins, Ruby,	Sci.,	Missouri Valley,	Harrison.
House, Harry M.,	C. E.,	Mechanicsville,	Cedar.
House, Wilbur M.,	E. E.,	Mechanicsville,	Cedar.
Howard, Alva L.,	Vet.,	Ames,	Story.
Howard, Willis E.,	E. E.,	Des Moines,	Polk.
Hudson, Wm. J.,	M. E.,	Muscatine,	Muscatine.
Hunt, Donald,	Agric.,	Logan,	Harrison.
Hunter, H. Clyde,	C. E,	Oelwein,	Fayette.
Hurless, Marjory,	D. E.,	Perry,	Dallas.
Hutchison, W. E.,	C. E.,	Dawson,	Dallas.
Hyzer, Fred,	Agric.,	Richland,	Keokuk.
Isakson, A. E.,	E. E.,	Canton,	*South Dakota.*
Jacoby, James,	M. E.,	Burlington,	Des Moines.
Jay, D. A.,	A. H.,	Blakesburg,	Wapello.
Johnson, A. Ray,	Agric.,	Searsboro,	Poweshiek.
Johnson, H. C.,	Vet.,	Ames,	Story.
Johnson, Isaac B.,	Hort.,	Humboldt,	Humboldt.
Johnson, Paul,	Agric.,	Cherokee,	Cherokee.
Johnson, Virgil,	Vet.,	Ames,	Story.
Johnston, Harold E.,	Vet.,	Keosauqua,	Van Buren.
Johnston, J. Raymond,	C. E.,	Greenfield,	Adair.
Jonker, Herman,	Vet.,	Eldora,	Hardin.
Jordan, Hugo,	Agric.,	Talca.	*South America.*
Josselyn, George,	Agric.,	Cedar Rapids,	Linn.
Joy, Harry,	Agric.,	Logan,	Harrison.
Juhl, Chris,	Vet.,	Estherville,	Emmet.
Kalbach, Taylor P.,	A. E.,	Oskaloosa,	Mahaska.
Kearney, Glenn,	Agric.,	Osage,	Mitchell.
Keith, Roger,	Mn. E.,	Des Moines,	Polk.
Kerr, Harry A.,	C. E.,	Park Rapids,	*Minnesota.*
Ketman, George F.,	A. E.,	Humboldt,	Humboldt.
Kilby, Don,	E. E.,	Ottumwa,	Wapello.
Kirk, Ivan M.,	E. E.,	Corydon,	Wayne
Kirkham, Kenzie,	M. E.,	Ames,	Story.
Kirkpatrick, Ellis L.,	Agric..	South English,	Keokuk.
Kriechbaum, Carl,	E. E.,	Burlington,	Des Moines.
Lacey, Lydia Eva,	Sci.,	Council Bluffs,	Pottawattamie.
Lacey, Sumner,	E. E.,	Council Bluffs,	Pottawattamie.
Landman, Sebastian J.,	E. E.,	Keokuk,	Lee.
Lawton, I. A.,	M. E.,	Newell,	Buena Vista.
Lee, A. Earle,	E. E.,	Waterloo,	Blackhawk.
Lee, W. A.,	Agric.,	Hanover,	*Virginia.*
Leedham, Tom,	M. E.,	Lyons,	Clinton.
Lenning, Omer,	M. E.,	Ellsworth,	Hamilton.
Levsen, Paul,	Agric.,	Wyoming,	Jones.
Lewis, Joe,	Agric.,	Ames,	Story.
Linn, Jean,	D. E.,	Canton,	South Dakota.
List, Theo. L.,	Vet.,	Greenville,	Clay.
Longer, Fred,	C. E.,	Ames,	Story.
Longnecker, A. C.,	Ag. E.,	Shelby,	Shelby.
Luithly, H. Arthur,	Agric.,	Ames,	Story.
Lynn, Harry,	Agric.,	Sigourney,	Keokuk.
MacGowan, Nelson,	E. E.,	Ottumwa,	Wapello.
Macklin, William,	Vet.,	Ames,	Story.
Madsen, Harry,	Agric.,	Ruthven,	Palo Alto.

Mallette, F. G.,	C. E.,	Garden Grove,	Decatur.
Markward, Herbert,	Agric.,	Funk,	*Nebraska.*
Marsh, George,	Mn. E.,	Atlantic,	Cass.
Martin, Edgar,	E. E.,	Washington,	Washington.
Mason, Orbie,	D. E.,	Waterloo,	Blackhawk.
Meier, Orma,	D. E.,	Postville,	Allamakee.
Meltzer, William,	Agric.,	Ames,	Story.
Mereness, Arthur G.,	C. E.,	Glidden,	Carroll.
Merritt, Ben,	C. E.,	Ft. Dodge,	Webster.
Messinger, Arthur R.,	C. E.,	Fonda,	Pocahontas.
Milheim, Edward,	Music,	Oelwein,	Fayette.
Miller, Arthur F.,	Agric.,	Burlington,	Des Moines.
Miller, Clarence E.,	C. E.,	Chicago,	*Illinois.*
Miller, Herbert,	C. E.,	Des Moines,	Polk.
Miller, Virgil C.,	Agric.,	Eldora,	Hardin.
Milligan, Harry,	Agric.,	Sioux City,	Woodbury.
Mills, Rollin J.,	Agric.,	Huron,	*South Dakota.*
Minkler, Warren,	E. E.,	Ames,	Story.
Minthorne, Pearl,	D. E.,	Castana,	Monona.
Mitchell, Jennie,	D. E.,	Ames,	Story.
Mitchell, J. Lithgow,	Agric.,	Burlington,	Des Moines.
Montgomery, C. J.,	Agric.,	Davenport,	Scott.
Moore, Elnathan J.,	C. E.,	Cedar Rapids,	Linn.
Moore, Lela Louise,	D. E.,	Chicago,	*Illinois.*
Moore, R. G.,	Vet.,	Algona,	Kossuth.
Moorehead, Helen,	D. E.,	Ida Grove,	Ida.
Morrison, Henrietta,	D. E.,	Reinbeck,	Grundy.
Morse, Reed,	Agric.,	Huron,	*South Dakota.*
Mosher, Frank,	C. E.,	Ames,	Story.
Moshier, Clarence,	Agric.,	Linden,	Dallas.
Mott, Claude,	E. E.,	Spirit Lake,	Dickinson.
Mould, Henry E.,	E. E.,	Sioux City,	Woodbury.
Mulhern, Ray,	E. E.,	Greenfield,	Adair.
Murdoch, William Tracy,	Agric.,	Lyons,	Clinton.
Murray, L. J.,	A. H.,	Galva,	Ida.
Myers, Bernard Floyd,	Agric.,	Des Moines,	Polk.
Myers, Hazel,	D. E.,	Shell Rock,	Butler.
Myers, Ralph,	E. E.,	Ottumwa,	Wapello.
McBeath, Verna,	Sci.,	Whiting,	Monona.
McBride, Forrest,	Agric.,	Stanhope,	Hamilton.
McBroom, L. A.,	C. E.,	Des Moines,	Polk.
McChord, Robert Caldwell,	Agr.,	Lebanon,	*Kentucky.*
McClintock, Ruth,	D. E.,	Cedar Rapids,	Linn.
McCormick, Will,	M. E.,	Clarion,	Wright.
McCracken, Harry,	Agric.,	Manilla,	Crawford.
McCray, Harold,	E. E.,	Marble Rock,	Floyd.
McDonald, John,	Vet.,	Ames,	Story.
McDonald, Myrtle,	Sci.,	Ames,	Story.
McDonald, Roy,	Agric.,	Ames,	Story.
McGavren Ward,	A. E.,	Missouri Valley,	Harrison.
McHose, Ray,	Mn. E.,	Nevada,	Story.
McKee, Daniel,	A. H.,	London,	*England.*
McKim, Bruce B.,	C. E.,	Deloit,	Crawford.
McKim, Elizabeth,	Sci.,	Deloit,	Crawford.
McKitterick, Robert,	M. E.,	Burlington,	Des Moines.
McMichael, Harry A.,	Agric.,	Paulding,	*Ohio.*
McMillen, Ralph Otis,	Agric.,	Van Wert,	*Ohio.*
McNay, Harry,	Agric.,	Chariton,	Lucas.
McWilliams, Glenn H.,	Agric.,	Wall Lake,	Sac.

Neis, Carl,	Vet.,	Keosauqua,	Van Buren.
Nelson, Girton,	A. H.,	Goldfield,	Wright.
Nelson, James Carmer,	A. H.,	Boulder,	*Colorado.*
Nelson, Oscar,	M. E.,	Woodward,	Dallas.
Newsome, Roy,	Agric.,	Derby,	Lucas.
Nichols, Niva,	Music,	Ames,	Story.
Nordstrum, Mary,	D. E.,	Shenandoah,	Page.
Nordstrum, R. F.,	Vet.,	Humboldt,	Humboldt.
Norton, Ray A.,	M. E.,	Holstein,	Ida.
Nutty, N. S.,	Vet.,	Nevada,	Story.
Odendahl, Irve E.,	C. E.,	Boone,	Boone.
Oestrich, Gladys,	D. E.,	Humboldt,	Humboldt.
Olsen, James C.,	C. E.,	Ellsworth,	Hamilton.
Olson, Sanford,	Agric.,	Ames,	Story.
Osborn, Floyd A.,	Agric.,	Shelby,	Shelby.
Patterson, Nellie,	D. E.,	Burt,	Kossuth.
Peck, Louis,	Agric.,	Shenandoah,	Page.
Perry, Thomas R.,	5 yr. C. E.,	Lime Springs,	Howard.
Peterson, Franklin Noel,	M. E.,	Storm Lake,	Buena Vista.
Pfautz, Forreste,	Agric.,	Lisbon,	Linn.
Pfeffer, Charles,	E. E.,	Cedar Rapids,	Linn.
Phelps, Harry,	C. E.,	Knoxville,	Marion.
Pickus, Joseph,	C. E.,	Sioux City,	Woodbury.
Pitts, Ilma G.,	D. E.,	Mondamin,	Harrison.
Poage, Blythe,	Sci.,	Baxter,	Jasper.
Pollock, Roscoe C.,	Sci.,	Martinsburg,	Keokuk.
Preston, Perry,	C. E.,	Des Moines,	Polk.
Prine, Edna,	D. E.,	Tama,	Tama.
Pulver, C. W.,	C. E.,	Ames,	Story.
Quint, Bryce Alfonzo,	Agric.,	Des Moines,	Polk.
Rakow, Clarence L.,	E. E.,	Oskaloosa,	Mahaska.
Ramey, Ethel,	Music,	Ames,	Story.
Rawson, Theo M.,	Vet.,	Quincy,	*Michigan.*
Rees, Joe,	Agric.,	Ida Grove,	Ida.
Reynolds, Harry,	C. E.,	Council Bluffs,	Pottawattamie.
Rice, C. D.,	Vet.,	Richmond,	*Kentucky.*
Richardson, Willa,	D. E.,	Manchester,	Delaware.
Richer, Lora May	Music,	Ames,	Story.
Rieke, Herbert,	Agric.,	Blairstown,	Benton.
Ringheim, Horace,	Agric.,	Canton,	*South Dakota.*
Roberson, Frank,	E. E.,	Ames,	Story.
Rogers, Raymond,	M. E.,	Dunlap,	Harrison.
Ross, Roy,	Vet.,	Winterset,	Madison.
Rukes, Charles,	M. E.,	Des Moines,	Polk.
Rush, Fern,	D. E.,	Ames,	Story.
Rust, H. A.,	Agric.,	Sheffield,	Franklin.
Sar, Martin,	Agric.,	Essex,	Page.
Sarvis, Fred,	C. E.,	What Cheer,	Keokuk.
Sauerberg, Julia K.,	D. E.,	Mason City,	Cerro Gordo.
Schaal, Robert B.,	E. E.,	Polk City,	Polk.
Schmidt, F. E.,	M. E.,	Marshalltown,	Marshall.
Schoch, Henry C.,	E. E.,	Dubuque,	Dubuque.
Schreck, Robert,	Agric.,	Iowa Falls,	Hardin.
Schwab, J. W.,	Agric.,	Ames,	Story.
Schwertley, John H.,	C. E.,	Modale,	Harrison.
Scott, Minnie Elizabeth,	D. E.,	Ames,	Story.
Scott, A. Floyd,	Agric.,	Cedar Rapids,	Linn.
Seba, H.,	Agric.,	Monticello,	Jones.
Shallenberger, James K.,	M. E.,	Des Moines,	Polk.

Shaw, George,	E. E.,	Oelwein,	Fayette.
Shawver, Cecil,	Agric.,	Pleasantville,	Marion.
Shearer, Brace A.,	Vet.,	Maquoketa,	Jackson.
Shinkle, Clara,	D. E.,	Ames,	Story.
Shoemaker, Joseph,	E. E.,	Albia,	Monroe.
Shoemaker, L. L.,	Agric.,	Corning,	Adams.
Silver, Frank,	Agric.,	Cantril,	Van Buren.
Simms, Bessie,	Sci.,	Beaman	Grundy.
Simpson, Arthur R.,	Agric.,	Onawa,	Monona.
Skahill, P. H.,	E. E.,	Ames,	Story.
Skartvedt, Ansgar,	Agric.,	Inwood,	Lyon.
Slagg, L. W.,	C. E.,	Manilla,	Crawford.
Smith, A. N.,	Agric.,	Ames,	Story.
Smith, Annabel,	Music,	Colo,	Story.
Smith, F. Herbert,	Agric.,	Oskaloosa,	Mahaska.
Smith, Milton O.,	Agric.,	Whiting,	Monona.
Smith, Roy M.,	Mn. E.,	Bonaparte,	Van Buren.
Smith, Will Allen,	Agric.,	Reinbeck,	Grundy.
St. John, Florence,	Music,	Keosauqua,	Van Buren.
Snook, Olive A.,	D. E.,	Des Moines,	Polk.
Snyder, Leroy D.,	C. E.,	Humboldt,	Humboldt.
Spurrier, William A.,	Agric.,	Des Moines,	Polk.
Staker, Carl,	M. E.,	Woodward,	Dallas.
Stauffer, Omar,	Agric.,	Tiskilwa,	*Illinois.*
Steffen, Edwin,	Agric.,	Storm Lake,	Buena Vista.
Stewart, Carl A.,	C. E.,	Grinnell,	Poweshiek.
Stookey, Carl,	M. E.,	Cedar Rapids,	Linn.
Stookey, D. D.,	Agric.,	Cedar Rapids,	Linn.
Stork, Verner,	Agric.,	Garner,	Hancock.
Storm, Van M.,	Agric.,	Ames,	Story.
Stott, L. N.,	Vet.,	Mason City,	Cerro Gordo.
Strickler, Elmer,	C. E.,	Centerville,	Appanoose.
Stubbs, George D.,	Vet.,	Wortham,	*Texas.*
Sullivan, J. Butler,	C. E.,	Humeston,	Wayne.
Summers, Walter,	E. E.,	Ames,	Story.
Sumner, Maude,	Music,	Fairfield,	Jefferson.
Swanson, Arthur,	Vet.,	Webster City,	Hamilton.
Swigart, Clarence,	Agric.,	Newton,	Jasper.
Swisher, Leslie,	M. E.,	New Sharon,	Mahaska.
Sykes, Allen L.,	M. E.,	Manilla,	Crawford.
Talcott, Elmer,	C. E.,	West Union,	Fayette.
Taylor, B. L.,	C. E.,	Ames,	Story.
Tedrow, Claire D.,	Sci.,	Williams.	Hamilton.
Thielke, Grace,	Music,	South Omaha,	*Nebraska.*
Templeton, Homer,	Sci.,	Ames,	Story.
Terrall, Jay,	Agric.,	Reinbeck,	Grundy.
Thomas, Hazel,	D. E.,	Charles City,	Floyd.
Thomas, Lester E.,	Agric.,	Elvaston,	*Illinois.*
Thompson, Lena F.,	D. E.,	Jamaica,	Guthrie.
Thompson, Lora,	D. E.,	Burt,	Kossuth.
Thompson, Walter,	Vet.,	Ames,	Story.
Thornton, F. B.,	E. E.,	Pocahontas,	Pocahontas.
Thorson, Theo.,	Agric.,	Forest City,	Winnebago.
Towe, Severn,	Agric.,	Paullina,	O'Brien.
Triggs, Fred,	M. E.,	Lake Park,	Dickinson.
Tripp, Howard,	Agric.,	Ruthven,	Palo Alto.
Troeger, Paul C.,	Agric.,	Storm Lake,	Buena Vista.
Trottnow, Ivan Emery,	C. E.,	Dysart,	Tama.
Truax, T. Roy,	Sci.,	Yale,	Guthrie.

Tudor, J. M.,	Agric.,	Iowa City,	Johnson.
Tuttle, Randall,	Agric.,	Spencer,	Clay.
Tydeman, Will R.,	E. E.,	Iowa Falls.	Hardin.
Tyler, Merle,	C. E.,	Logan,	Harrison.
Uhland, Fred,	Agric.,	Breckenridge,	*Missouri.*
Vale, Bruce R.,	Agric.,	Bonaparte,	Van Buren.
Van Boskirk, Serrin,	Agric.,	Marengo,	Iowa.
Van Keuren, Ralph,	Agric.,	Troy,	*Pennsylvania.*
te Veltrup, Edward,	E. E.,	Sioux Center,	Sioux.
Vincent, Clarice,	D. E.,	Ames,	Story.
Vondracek, Lumir,	Agric.,	Cedar Rapids,	Linn.
Voss, Lilla,	D. E.,	Cedar Rapids,	Linn.
Walker, Ben,	Agric.,	Ames,	Story.
Walker, Marion,	D. E.,	Vinton,	Benton.
Wallace, Laurence G.,	Hort.,	Des Moines,	Polk.
Walls, Mildred,	Sci.,	Clinton,	Clinton.
Walton, Joseph N.,	E. E.,	Washington,	Washington.
Ward, Harry E.,	Agric.,	Algona,	Kossuth.
Warner, J. Harry,	Agric.,	Ames,	Story.
Warsaw, W.,	E. E.,	Riceville,	Mitchell.
Watkins, Charles,	Vet.,	Keosauqua,	Van Buren.
Watson, James G.,	Agric.,	Ames,	Story.
Watson, William B.,	Agric.,	Rock Rapids,	Lyon.
Watts, Everett,	Agric.,	Hedrick,	Keokuk.
Watts, Lyle,	Agric.,	Clear Lake,	Cerro Gordo.
Webster, Helena,	Sci.,	Ames,	Story.
Weirick, Laura,	D. E.,	Ames,	Story.
Welch, LeRoy,	C. E.,	Clarinda,	Page.
Weller, Curtis,	C. E.,	New London,	Henry.
Weller, Edward J.,	Sci.,	Waterloo,	Blackhawk.
Welles, Edward,	Sci.,	Sioux City,	Woodbury.
Wells, Leon,	M. E.,	Davenport,	Scott.
West, Frank,	Agric.,	Honey Creek,	Pottawattamie.
Westbrooke, Edwin M.,	C. E.,	Ames,	Story.
Weston, William Boyd,	M. E.,	Ames,	Story.
Wetherbee, Edwin C.,	Agric.,	Marshalltown,	Marshall.
Weyrauch, Edward,	Agric.,	Iowa Falls,	Hardin.
Wheatley, Charles E.,	Agric.,	Hillsboro,	Henry.
Wheatley, Raymond A.,	Agric.,	Ames,	Story.
Whitaker, D. G.,	Agric.,	Hillsboro,	Henry.
White, Helen,	D. E.,	Marion,	Linn.
White, Muriel,	D. E.,	Marion,	Linn.
Willey, Florence,	Sci.,	Ames,	Story.
Williams, Clifford S.,	Agric.,	Glenwood,	Mills.
Williams, R. E.,	Agric.,	Iowa City,	Johnson.
Williamson, W. H.,	Agric.,	Garner,	Hancock.
Wills, Miriam,	D. E.,	Eldora,	Hardin.
Wilson, Charles P.,	Mn. E.,	Ames,	Story.
Wilson, D. B.,	Vet.,	West Liberty,	Muscatine.
Wilson, Foster W.,	Agric.,	Rockwell City,	Calhoun.
Witter, Glenn F.,	Agric.,	Des Moines,	Polk.
Wolfe, Anna Marie,	D. E.,	Keokuk,	Lee.
Woodruff, Roscoe,	C. E.,	Oskaloosa,	Mahaska.
Woodworth, B.,	E. E.,	Shenandoah,	Page.
Woody, Ethel E.,	D. E.,	Ames,	Story.
Wormley, Barton,	Agric.,	Newton,	Jasper.
Wormley, Don S.,	E. E.,	Newton,	Jasper.
Wray, G. Edward,	M. E.,	Creston,	Union.
Wright, Thos. Henry,	5 yr. E. E.,	Ft. Dodge,	Webster.

Wygle, Lila,	D. E.,	Ames,	Story.

Total, 498

ACADEMIC.

NAME	COURSE	TOWN	COUNTY
Adams, William,	Agric.,	Ames,	Story.
Aguado, Pedro,	E. E.,	Manila,	*Philippine Isl.*
Alcorn, Waldo A.,	C. E.,	Gibson,	Keokuk.
Anderson, Leo F.,	Agric.,	Dawson,	Dallas.
Anthony, Fred H.,	C. E.,	Camanche,	Clinton.
Arbaugh, Bertha,	Sci.,	Mondamin,	Harrison.
Axten, E. B.,	E. E.,	Boyden,	Sioux.
Bacon, James,	Agric.,	Milton,	Van Buren.
Baird, Arthur E.,	C. E.,	North English,	Iowa.
Ballard, Morton I.,	M. E.,	Garner,	Hancock.
Barton, Josephine,	Sci.,	Ames,	Story.
Bauder, Ernest,	M. E.,	Elgin,	Fayette.
Baxter, Luke J.,	Agric.,	Galva,	Ida.
Bilsborough, Abner,	Sci.,	Little Rock,	Lyon.
Blinks, M. E.,	M. E.,	Marion,	Linn.
Bogert, Theo L.,	Agric.,	Evanston,	*Illinois.*
Bone, Joe,	Agric.,	Albia,	Monroe.
Bouricius, G. J.,	E. E.,	Council Bluffs,	Pottawattamie.
Brattland, Isabel,	Sci.,	Ada,	*Minnesota.*
Brintnall, Gilbert,	Agric.,	Ames,	Story.
Brinton, Scott M.,	E. E.,	Ellsworth,	Hamilton.
Brown, Charles Neil,	5 yr. E. E.,	Centerville,	Appanoose.
Brown, Ralph M.,	Agric.,	Jefferson,	Greene.
Burkhart, Almer,	Agric.,	Hawkeye,	Fayette.
Burnham, Clarence,	C. E.,	West Union,	Fayette.
Butterfield, W. S.,	Agric.,	Norfolk,	*Nebraska.*
Campbell, Harold,	E. E.,	Coggon,	Linn.
Clapp, Alfred,	Agric.,	West Union,	Fayette.
Coldren, Cassius M.,	E. E.,	Milford,	Dickinson.
Comfort, F. J.,	Cer.,	Mason City,	Cerro Gordo.
Cook, Augusta,	Sci.,	Dexter,	Dallas.
Cool, Claude A.,	C. E.,	Waverly,	Bremer.
Connolly, Allen H.,	C. E.,	Ottumwa,	Wapello.
Cooper, Arthur M.,	Agric.,	Knierim,	Calhoun.
Cord, John,	Agric.,	Danbury,	Woodbury.
Cornwell, H. P.,	Agric.,	Ankeny,	Polk.
Courtney, Clarence,	Agric.,	Coon Rapids,	Carroll.
Covey, Ellis E.,	M. E.,	Ames,	Story.
Cushman, Eugene V.,	E. E.,	Centerville,	Appanoose.
Dahl, Grant,	E. E.,	Perry,	Dallas.
Daniel, Hawthorne L.,	M. E.,	Omaha,	*Nebraska.*
Dawson, Francis A.,	C. E.,	Reynolds,	*Illinois.*
Deck, Herman,	C. E.,	Decatur City,	Decatur.
Dewey, Glenn,	5 yr. E. E.,	West Union,	Fayette.
Dickman, Arno,	Agric.,	South Omaha,	*Nebraska.*
Dilly, Cora,	D. E.,	Grundy Center,	Grundy.
Dimmick, Alfred E.,	C. E.,	Chanute,	*Kansas.*
Dodge, W. A.,	C. E.,	Des Moines,	Polk.
Dolcini, Valente F.,	Agric.,	Paullina,	O'Brien.
Drebert, Kimball,	C. E.,	Norfolk,	*Nebraska.*
Dye, Willoughby,	Agric.,	Macedonia,	Pottawattamie.
Eggers, Louis W.,	C. E.,	Victor,	Iowa.

Eichling, Paul Otto,	Agric.,	Paulding,	*Ohio.*
Emmett, Petra,	Sci.,	Belmond,	Wright.
Englar, D. Sterling,	C. E.,	Panora,	Guthrie.
Erickson, Edwin,	Agric.,	Randall,	Hamilton.
Espe, Knute,	Agric.,	Jewell Junction,	Hamilton.
Eustice, Earl,	A. H.,	Newton,	Jasper.
Evans, Edward R.,	5 yr. C. E.,	Lime Springs,	Howard.
Fairbanks, C. C.,	Agric.,	Anamosa,	Jones.
Fairchild, Julia,	D. E.,	Clinton,	Clinton.
Fairfield, Helen,	Sci.,	Ames,	Story.
Fancolly, Mary,	D. E.,	Atlantic,	Cass.
Feuling, Ellen,	Sci.,	Ames,	Story.
Fiss, Walter,	Agric.,	St. Louis,	*Missouri.*
Fobes, Kinsey Kenneth,	Agric.,	Ida Grove,	Ida.
Frazier, E. H.,	C. E.,	Ames,	Story.
French, Fred,	Agric.,	Farmington,	Van Buren.
Frey, Frank,	Agric.,	Ames,	Story.
Garberson, Glenn,	Agric.,	Sibley,	Osceola.
Garza, Policarpo,	Agric.,	Monclova,	*Mexico.*
Gonzalez, Louis,	Agric.,	Monclova,	*Mexico.*
Graves, Leona,	Sci.,	Ames,	Story.
Gray, Ethel,	D. E.,	Postville,	Allamakee.
Green, Le Roy D.,	Mn. E.,	New York,	*New York.*
Greene, Harold,	Agric.,	Scranton,	Greene.
Grover, Charlie B.,	C. E.,	Ames,	Story.
Gruwell, Harry,	E. E.,	Ames,	Story.
Hanlin, Frank,	C. E.,	Williams,	Hamilton.
Hanson, Edmund P.,	Agric.,	Dean,	Appanoose.
Hartnell, C. H.,	M. E.,	Stacyville,	Mitchell.
Harvey, Elta,	Sci.,	Ames,	Story.
Hayes, G. L.,	Sci.,	Mt. Ayr,	Ringgold.
Henderson, R. E.,	C. E.,	Wellman,	Washington.
Hogrefe, Paul H.,	Agric.,	Battle Creek,	*Nebraska.*
Horne, Charles,	Agric.,	Mt. Ayr,	Ringgold.
Horton, Floyd,	Agric.,	Ames,	Story.
Houser, Albert,	E. E.,	Cedar Rapids,	Linn.
Howland, Paul R.,	E. E.,	Melbourne,	Marshall.
Hutchens, Lewis,	C. E.,	New Providence,	Hardin.
Hyndshaw, Silas,	A. H.,	Council Bluffs,	Pottawattamie.
Igo, Phil,	Agric.,	Indianola,	Warren.
Ingebritson, Hans,	Agric.,	Grand Mound,	Clinton.
Jennes, Chesley F.,	Agric.,	Waterloo,	Blackhawk.
Jensen, Florence,	D. E.,	Ames,	Story.
Johnson, Charles,	Agric.,	Laurens,	Pocahontas.
Johnson, Earl H.,	Agric.,	Boone,	Boone.
Jones, Orra,	D. E.,	Coon Rapids,	Carroll.
Kane, Frank A.,	E. E.,	Marshalltown,	Marshall.
Keigley, Claire,	M. E.,	Ames,	Story.
Kennedy, Carl N.,	Agric.,	Ames,	Story.
Kimball, Lucy,	D. E.,	Council Bluffs,	Pottawattamie.
Kopold, Charles,	E. E.,	Dubuque,	Dubuque.
Krall, John Allen,	Agric.,	Ames,	Story.
Kreamer, Frank,	C. E.,	Arlington,	Fayette.
Kriethe, Paul,	Agric.,	Burt,	Kossuth.
Keubler, Irwin,	Agric.,	Calamus,	Clinton.
Kukkuck, Edward F.,	E. E.,	Preston,	Jackson.
LaFrentz, George,	M. E.,	Laurel,	Marshall.
Lamhofer, Eric,	Agric.,	Omaha,	*Nebraska.*
Leffler, Lizzie,	Sci.,	Stockport,	Van Buren.

Lindsay, Raymond,	E. E.,	Sidney,	Fremont.
Lippincott, Lucia,	D. E.,	Jacksonville,	*Illinois.*
Lissenden, Clyde,	Sci.,	Scranton,	Greene.
Lodwick, Llewelyn,	Mn. E.,	Ottumwa,	Wapello.
Long, Lloyd D.,	Agric.,	Lu Verne,	*Minnesota.*
Longhurst, Fred,	Agric.,	Cedar Rapids,	Linn.
Lora, Armando,	Agric.,	Havana,	*Cuba.*
Luithly, John,	**Sci.,**	Ames,	Story.
Lund, Fritz,	C. E.,	Clinton,	Clinton.
Madison, Walter G.,	M. E.,	Manor,	*Texas.*
Marcue, Carl,	Agric.,	Le Mars,	Plymouth.
Mardis, J. R.,	C. E.,	Des Moines,	Polk.
Maynard, Ray,	M. E.,	Inwood,	Lyon.
Mead, Edward,	Agric.,	Bouton,	Dallas.
Millar, F. D.,	**Hort.,**	Muscatine,	Muscatine.
Miller, George,	Agric.,	Ames,	Story.
Miller, Mary G.,	Sci.,	Des Moines,	Polk.
Minturn, Francis,	M. E.,	Winterset,	Madison.
Moore, Esco C.,	Agric.,	Moulton,	Appanoose.
Moore, Ora B.,	Agric.,	Moulton,	Appanoose.
Morgan, Boyd,	E. E.,	Coon Rapids,	Carroll.
Morris, Ernest,	C. E.,	Grand Junction,	Greene.
Mullany, Stephen,	M. E,	West Waterloo,	Blackhawk.
Myers, John W.,	E. E.,	Thurman,	Fremont.
McClenahan, Thos. David,	Agr.,	Cedar Rapids,	Linn.
McDonald, Charles,	E. E.,	Ames,	Story.
McDonald, Ethel,	D. E.,	Ames,	Story.
McLaughlin, Clifford,	Agric.,	Marathon,	Buena Vista.
Newman, John,	Agric.,	Des Moines,	Polk.
Nichol, Jessie,	Sci.,	Ida Grove,	Ida.
Notestine, Floyd,	C. E.,	Hardy,	Humboldt.
Olson, Marion,	Agric.,	Ames,	Story.
Olson, Sarah,	D. E.,	Ames,	Story.
Orr, Everett,	M. E.,	Sioux City,	Woodbury.
Parker, Robert H.,	C. E.,	Vesta,	*Arkansas.*
Paulson, George A.,	Agric.,	Davenport,	Scott.
Payne, E. T.,	Agric.,	Winterset,	Madison.
Peaslee, Oliver M.,	E. E.,	Ames,	Story.
Perry, Forrest G.,	Mn. E.,	Creston,	Union.
Peters, Mabel C.,	D. E.,	Sac City,	Sac.
Peterson, Elmer,	Agric.,	Kiron,	Crawford.
Pfleiger, Alma H.,	Sci.,	Gropenbeheingen,	*Germany.*
Pitts, Donald H.,	Sci.,	Mondamin,	Harrison.
Probst, Wallace,	M. E.,	Oskaloosa,	Mahaska.
Reeve, H. D.,	Agric.,	Des Moines,	Polk.
Reeve, Howard E.,	C. E.,	Des Moines,	Polk.
Reeve, John,	Agric.,	Hampton,	Franklin.
Reiger, Olive Victoria,	D. E.,	Springfield,	*Illinois.*
Rider, Ola,	Agric.,	Farmington,	Van Buren.
Ritter, Harry,	Agric.,	Marshalltown,	Marshall.
Root, Edna V.,	D. E.,	Delta,	Keokuk.
Rossing, Tedman,	Sci.,	Bode,	Humboldt.
Rush, I. L.,	C. E.,	Ames,	Story.
Schoel, C. R.,	E. E.,	Gladbrook,	Tama.
Schulte, Lewis E.,	M. E.,	Mitchell,	Mitchell.
Schwartz, Fred,	Agric.,	Lyons,	Clinton.
Secor, Manley,	Agric.,	Forest City,	Winnebago.
Sefton, Leta,	D. E.,	Mt. Auburn,	Benton.
Shanley, Adrian,	E. E.,	Ames,	Story.

Shaw, Robert,	C. E.,	Olin,	Jones.
Shepherd, Odell,	E. E.,	Panora,	Guthrie.
Silva, William H.,	Agric.,	Bessarabia,	*Russia.*
Skinner, S. P.,	Agric.,	Westfield,	*New York.*
Sloan, Lewis,	E. E.,	Sioux City,	Woodbury.
Smith, Florence Nancy,	Sci.,	Cedar Rapids,	Linn.
Smith, Ralph P.,	C. E.,	Clarion,	Wright.
Smith, Roger,	C. E.,	Manson,	Calhoun.
Snow, Wayne,	E. E.,	Thurman,	Fremont.
Spitzbarth, Lloyd,	Agric.,	Rockwell City,	Calhoun.
Stapleton, Elizabeth,	D. E.,	Spirit Lake,	Dickinson.
Sterrett, Clifford,	Agric.,	Des Moines,	Polk.
Stevens, Charles C.,	Mn. E.,	Williams,	Hamilton.
Strever, John E.,	A. H.,	Webster City,	Hamilton.
Strickler, Omar,	Agric.,	Centerville,	Appanoose.
Stringer, Arthur,	E. E.,	Osage,	Mitchell.
Swisher, Harry D.,	C. E.,	Delta,	Keokuk.
Taff, Paul C.,	Agric.,	Panora,	Guthrie.
Talcott, G. G.,	Agric.,	Williams,	Hamilton.
Thornburg, Tom H.,	Agric.,	Linden,	Dallas.
Tiffany, Ray,	M. E.,	Oelwein,	Fayette.
Tompkins, Elmer,	M. E.,	Eagle Grove,	Wright.
Torres, Ambrosio,	M. E.,	Surigav,	*Philippine Isl.*
Tripp, Sadie,	D. E.,	Ruthven,	Palo Alto.
Turner, William R.,	Agric.,	Adair,	Adair.
Tuttle, Louise,	D. E.,	Des Moines,	Polk.
Ufford, Orville,	Agric.,	Ames,	Story.
Vader, Leo C.,	C. E.,	Pocahontas,	Pocahontas.
Vangsnes, Maguild,	D. E.,	Story City,	Story.
Vaughn, Edward,	Agric.,	Marion,	Linn.
Warburton, John,	A. H.,	Ames,	Story.
Warren, Elgin Stanley,	Agric.,	Webster City,	Hamilton.
Warren, Emma,	Sci.,	Weldon,	Decatur.
Wasem, Walter,	Agric.,	Ft. Dodge,	Webster.
Webb, Russel,	Agric.,	Norwalk,	Warren.
Welch, Earl G.,	A. E.,	Ames,	Story.
Wellendorf, Lloyd,	M. E.,	Algona,	Kossuth.
Wells, Helen May,	D. E.,	Marshalltown,	Marshall.
Whinery, Ray Garwood,	C. E.,	Marshalltown,	Marshall.
White, Homer,	C. E.,	Spirit Lake,	Dickinson.
Whiting, Fred T.,	M. E.,	Waukee,	Dallas.
Wilder, Morris,	M. E.,	Dow City,	Crawford.
Williams, Ira G.,	E. E.,	Blairsburg,	Hamilton.
Wilson, Fred B.,	M. E.,	Tipton,	Cedar.
Wilson, Wayne,	C. E.,	Seymour,	Wayne.
Wise, Guy,	E. E.,	Manson,	Calhoun.
Wright, Robert,	Agric.,	Carroll,	Carroll.
Zahner, Chauncey,	M. E.,	Modale,	Harrison.
Zimmer, Howard,	E. E.,	Perry,	Dallas.

Total, 219.

SPECIALS.

NAME	COURSE	TOWN	COUNTY
Andrews, H. L.,	C. E.,	Meriden,	Cherokee.
Blackwood, R. L.,	Agron.,	Newton,	Jasper.
Blake, Fred N.,	A. H.,	Maquoketa,	Jackson.
Cassady, R. W.,	A. H.,	Whiting,	Monona.
Cooley, Harry B.,	C. E.,	Council Bluffs,	Pottawattamie.

Cumings, Arthur B.,	Agric.,	Tabor,	Fremont.
Davenport, Lora,	Sci.,	Odebolt,	Sac.
Gutekunst, J. Giffert,	Agron.,	State Center,	Marshall.
Howe, John,	A. H.,	Council Bluffs,	Pottawattamie.
Lorenzo, Tomas,	M. E.,	San Fernando,	*Philippine Isl.*
Moore, Samuel,	A. H.,	Moulton,	Appanoose.
Penick, R. A.,	A. H.,	Chariton,	Lucas.
Stewart, S. A.,	C. E.,	Des Moines,	Polk.
Wilmarth, R. H.,	C. E.,	Ames,	Story.

Total, 14

SHORT COURSE.

NAME	COURSE	TOWN	COUNTY
Andrews, J. C.,	A. H.,	Davenport,	Scott.
Bacon, H. W.,	C. E.,	Keokuk,	Lee.
Beach, Frank H.,	A. E.,	Ames,	Story.
Berry, Beaufort,	A. H.,	Missouri Valley,	Harrison.
Bornholdt, Newton,	M. E.,	Davenport,	Scott.
Brown, M. A.,	A. H.,	Oskaloosa,	Mahaska.
Bruch, Maude Lillian,	D. E.,	Cedar Rapids,	Linn.
Campbell, Jessie,	D. E.,	Pleasanton,	Decatur.
Cowan, Robert,	Hort.,	Maitland,	*Missouri.*
Dominquez, Esequiel,	Agric.,	Julapa,	*Vera Cruz, Mex.*
Erickson, Reuben S.,	A. H.,	Lanyon,	Webster.
Forest, Charles R.,	A. H.,	Miles,	Jackson.
Fraseur, F. N.,	A. H.,	Tipton,	Cedar.
Fugger, T. J.,	M. E.,	Platte Center,	*Nebraska.*
Gericke, W. F.,	A. H.,	Fremont,	*Nebraska.*
Good, Harry C.,	Agric.,	Ames,	Story.
Gould, J. M.,	A. H.,	Ames,	Story.
Hall, Everett,	A. E.,	Whiting,	Monona.
Hanna, Leland,	Dairy,	Garrison,	Benton.
Hinkhouse, F. W.,	A. H.,	West Liberty,	Muscatine.
Hitchcock, Bion,	A. H.,	Muscatine,	Muscatine.
Holden, Oscar O.,	Agric.,	Bode,	Humboldt.
Jones, F. C.,	M. E.,	Brooklyn,	Poweshiek.
Kirk, George E.,	Agric.,	Marshalltown,	Marshall.
Kuehl, Harry L.,	A. H.,	Davenport,	Scott.
Kjosa, H. H.,	Agric.,	Olaf,	Wright.
Lang, Joe,	A. H.,	Wilton Junction,	Muscatine.
Larson, Charles F.,	A. H.,	La Moille,	Marshall.
Loonan, Lloyd J.,	A. H.,	Waterloo,	Blackhawk.
Mann, Karl L.,	M. E.,	Brighton,	Washington.
Minert, H. L.,	M. E.,	Ames,	Story.
McClusky, Walter,	A. H.,	Anthon,	Woodbury.
McKibben, Hazel,	Sci.,	Estherville,	Emmet.
McMillan, H. G.,	A. H.,	Sioux City,	Woodbury.
O'Rourke, John,	E. E.,	Des Moines,	Polk.
Otto, Iva DeVilla,	D. E.,	Castana,	Monona.
Parrett, Roy,	Agric.,	Batavia,	Jefferson.
Person, Nora E.,	D. E.,	Ames,	Story.
Rankin, Walter A.,	A. H.,	Greeley,	*Colorado.*
Rost, Fred,	A. H.,	Wilton Junction,	Muscatine.
Tudor, Gwen,	D. E.,	Iowa City,	Johnson.
Wilson, Hillis,	Agric.,	Garrison,	Benton.
Winthers, Arthur,	A. H.,	Cedar Falls,	Blackhawk.
Wise, L. O.,	A. H.,	Villisca,	Montgomery.

Total, 44

ONE YEAR DAIRY.

NAME	COURSE	TOWN	COUNTY
Assink, George,		Cedar Falls,	Blackhawk.
Austin, Carl,		Norfolk,	*Nebraska.*
Batchelder, Guy R.,		Lyons,	Clinton.
Beedle, H. W.,		Ames,	Story.
Bryan, William,		Hoprig,	Emmet.
Bulkeley, Fred L.,		Moretown,	*Vermont.*
Clemons, R. E.,		Zearing,	Story.
Cox, Warren,		Ames,	Story.
Cramore, Ed,		Fredsville,	Grundy.
Easterly, J.,		Ames,	Story.
Gibson, Clifford,		Danville,	Des Moines.
Guthrie, G. H.,		Zearing,	Story.
Hamilton, L. A.,		Sioux City,	Woodbury.
Hilton, Milford B.,		Cedar Falls,	Blackhawk.
Johnson, John,		Burr Oak,	Winneshiek.
Kelley, Floyd S.,		Monroe,	*Washington.*
Kepler, W. T.,		Davenport,	Scott.
Langford, J. B.,			
Morse, Claire,		Ames,	Story.
McNair, Albert,		Andes,	*New York.*
Pelley, A. O.,		Strawberry Point,	Clayton.
Person, Joseph,		Ames,	Story.
Sanders, L. R.,		Des Moines,	Polk.
Scoles, R. H.,		Nashua,	Chickasaw.
Shearer, Lewis,		Maquoketa,	Jackson.
Thomsen, Carl,		Fremont,	*Nebraska.*
Tjossem, Percy,		Spencer,	Clay.
Veien, Chris,		Portland,	*Oregon.*
White, Harry,		Ames,	Story.
Wombald, Clarence T.,		Greenfield,	Adair.
Zinn, C. H.,		Brooklyn,	*New York.*

Total, 31

MUSIC STUDENTS.

NAME	COURSE	TOWN	COUNTY
Allan, Ronald,	P., V.,	Ames,	Story.
*Anthony, Fred,	S. S.,	Camanche,	Clinton.
Aplin, Lucile,	S. S.,	Ames,	Story.
*Aguado, Pedro,	V.,	Manila,	*Philippine Isl.*
*Arbaugh, Bertha A.,	P.,	Mondamin,	Harrison.
Barnes, Hattie,	Vio.,	Gilbert Station,	Story.
*Barney, F. R.,	V.,	Hampton,	Franklin.
Baughman, Kittie,	P.,	Ames,	Story.
*Beach, Frank,	P.,	Ames,	Story.
Beach, Julius,	P.,	Ames,	Story.
Benson, Gertrude,	P.,	Ames,	Story.
Benson, Fern,	P.,	Ames,	Story.
*Benton, E. M.,	V.,	Peoria,	*Illinois.*
*Bud, Byron,	Vio.,	Duncombe,	Webster.
*Blake, Fred,	V.,	Maquoketa,	Jackson.
*Booher, Edith,	P.,	Danbury,	Woodbury.
*Bouricious, G. J.,	V.,	Council Bluffs,	Pottawattamie.
Brown, Florence,	P., H., Mus., H.,	Ames,	Story.
Buchanan, R. E.,	P.,	Ames	Story.
Campbell, Helen,	P.,	Ames,	Story.

*Campbell, C. B.,	S. S.,	Nashua,	Chickasaw.
Chadsy, Fern,	P.,	Ames,	Story.
Champlin, Mabel,	P.,	Ames,	Story.
*Chase, May,	P.,	Colorado Springs,	*Colorado.*
Clarke, Robert Mason,	V.,	Ames,	Story.
Clock, Emily,	V.,	Hampton,	Franklin.
*Cooper, Elmer E.,	Vio.,	Corning,	Adams.
Copeland, Frank,	S. S.,	Logan,	Harrison.
Cox, Irwin A.,	V.,	Des Moines,	Polk.
Curtiss, Ruth,	Vio.,	Ames,	Story.
*Davenport, Lora,	P.,	Odebolt,	Sac.
*Davis, Elizabeth A.,	P., H.,	Sutherland,	O'Brien.
Dodge, Blanche,	P.,	Nevada,	Story.
Doggett, J. S.,	V.,	Ames,	Story.
*Doty, H. S.,	S. S.,	Ames,	Story.
*Dickman, Eleanor,	S. S.,	South Omaha,	*Nebraska.*
Edenson, Clara,	P.,	Ames,	Story.
Edwards, Reba,	P.,	Ames,	Story.
Farnum, Mattie,	P.,	Ames,	Story.
Fogel, Estelle B.,	P., H.,	Ames,	Story.
Fuller, Mary,	P., V.,	Ames,	Story.
*Girton, E. S.,	P.,	State Center,	Marshall.
*Good, Harry,	V.,	Ames,	Story.
Griffith, Merrill,	Vio.,		————
Grimsby, Carolyn,	P.,	Ames,	Story.
Gunder, Virgil,	V.,	Ames,	Story.
Hansaker, Ethel,	V., P.,	Colo,	Story.
*Hampton, Maggie,	Vio.,	Coon Rapids,	Carroll.
Hardin, Max,	V.,	Ames,	Story.
Hopkins, Blanche,	P.,	Nevada,	Story.
Herr, Mildred,	P.,	Ames,	Story.
*Holden, Oscar O.,	V.,	Bode,	Humboldt.
*Hunt, Donald,	V.,	Logan,	Harrison.
*Hungerford, Josephine,	V.,	Carroll,	Carroll.
*Johnson, Frank B.,	P.,	Wall Lake,	Sac.
*Johnson, Floyd L.,	P.,	Boone,	Boone.
Jones, Katherine,	O.,	Omaha,	*Nebraska.*
*Jones, Orra,	V., P.,	Coon Rapids,	Carroll.
*Kalbach, Taylor P.,	P., O.,	Oskaloosa,	Mahaska.
Kooser, Ronald,	Vio.,	Ames,	Story.
Knapp, Hermine,	P.,	Ames,	Story.
Lake, Philena,	V., P.,	Gilbert Station,	Story.
Lang, Adeline,	V.,	Nevada,	Story.
*Lockwood, H. A.,	V.,	Central City,	Linn.
Longshore, Margaret,	V.,	Ames,	Story.
*Leveson, Paul E.,	Vio.,	Wyoming,	Jones.
*Macklin, Theodore,	P.,	Shanghai,	*China.*
Marston, Merrill,	P.,	Ames,	Story.
*Mason, J. W.,	O.,	Hedrick,	Keokuk.
Mather, Bessie,	V.,	Ames,	Story.
Mereness, Gertrude,	V.,	Ames,	Story.
*McElroy, Margaret,	P., O., V., H.,	Newton,	Jasper.
Minchin, Medora,	P.,	Ames,	Story.
*Miller, R. E.,	Vio.,	Estherville,	Emmet.
Mitchell, Ella,	Vio.,	Ames,	Story.
Morris, Edward,	P.,	Ames,	Story.
Morris, Elinor,	P.,	Ames,	Story.
Okey, F. M.,	P.,	Ames,	Story.
Okey, Myrtle,	P., V.,	Ames,	Story.

Orton, Miriam,	P.,	Ames,	Story.
*Osborne, F. A.,		Shelby,	Shelby.
*Pammel, Edna,	V.,	Ames,	Story.
Pammel, Doris,	P.,	Ames,	Story.
*Parrett, Roy,	P.,	Batavia,	Jefferson.
Parsons, Ruby,	V.,	Ames,	Story.
Pease, Emma,	P.,	Nevada,	Story.
*Pflieger, Alma,	P.,	Ames,	Story.
Pike, Ethel,	V.,	Ames,	Story.
Prall, Warren,	Vio.,	Ames,	Story.
*Randolph, Gail,	V.,	Tama,	Tama.
Ringgenberg, Calvin,	O.,	Ames,	Story.
*Rowat, Thomas,	P.,	Des Moines,	Polk.
*Schmidt, Marie,	P., V.,	Ames,	Story.
*Searle, Mollie,	V.,	Nemaha,	Sac.
Shepherd, Mabel,	V.,	Gilbert Station,	Story.
*Simms, Bessie,		Beaman,	Grundy.
Smith, Marcellus,	O.,	Ames,	Story.
*Smullin, G. W.,	S. S.,	Clinton,	Clinton.
Stull, Vada,	S. S.,	Ames,	Story.
Storms, Lillian,	V.,	Ames,	Story.
Tinsley, Grace,	V.,	Ames,	Story.
Tunis, Florence,	P.,	Ames,	Story.
Tune, Ingeborg S.,	V.,	Ames,	Story.
Tuttle, R. M.,	S. S., P.,	Spencer,	Clay.
Valentine, Hannah,	P.,	Ames,	Story.
Valentine, Isabel,	P.,	Ames,	Story.
*Vangness, Maguild,	V.,	Story City,	Story.
Wasser, Blanche,	P.,	Ames,	Story.
Walls, Florence,	V.,	Ames,	Story.
Waltmire, Bailey,	Vio.,	Ames,	Story.
Waters, Carrie,	P.,	Ames,	Story.
Watson, Mrs. Jack,	Vio.,	Ames,	Story.
*Waggoner, J. E.,		Primghar,	O'Brien.
Wentworth, E. N.,	V.,	Ames,	Story.
*Westbrook, E. M.,	V.,	Ames,	Story.
Williams, Nellie,	V.,	Ames,	Story.
Wood, Mayme,	V.,	Ames,	Story.
Wyatt, Mary,	P.,	Colo,	Story.
Zimmerman, Alta,	P.,	Ames,	Story.

Total, 133
Less duplicates, 60

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Abbreviations: P., Piano; V., Voice; Vio., Violin; H., Harmony; Mus. His., Musical History; S. S., Sight Singing; O., Organ.

*Students also enrolled in other courses.

ENROLLMENT FOR SHORT COURSES IN STOCK AND GRAIN JUDGING.

NAME	COURSE	TOWN	COUNTY
Acton, H. L.,		Eldon,	Wapello.
Adair, Fred,		Redding,	Ringgold.
Adams, C. W.,		Ames,	Story.
Adams, J. Z.,		Little Sioux,	Harrison.
Adams, R. P.,		Solon,	Johnson.

Allen, John W.,	Zearing,	Story.
Anderson, Alex,	Britt,	Hancock.
Anderson, Edward J.,	Stanhope,	Hamilton.
Anderson, Gust,	Perry,	Dallas.
Anderson, Nels,	Roland,	Story.
Anderson, Oscar,	Roland,	Story.
Anderson, Walter,	Harcourt,	Webster.
Andrew, Jess C.,	Lafayette,	*Indiana.*
Anglum, Lloyd P.,	Larchwood,	Lyon.
Apland, A.,	Huxley,	Story.
Armstrong, A. J.,	Fairfield,	Jefferson.
Arnold, C. A.,	Klemme,	Hancock.
Aspenbremner, C. J.,	Dysart,	Tama.
Bailey, Earl W.,	Bussey,	Marion.
Baird, S. Dean,	Redding,	Ringgold.
Baker, J. Anthony,	Jolley,	Calhoun.
Bakker, William,	Wellsburg,	Grundy.
Balster, D. C.,	Monmouth,	Jackson.
Balster, E. L.,	Monmouth,	Jackson.
Barber, L. L.,	Corwith,	Hancock.
Barker, Mrs. F. A.,	Independence,	Buchanan.
Barr, Earl,	Homer,	Hamilton.
Baughey, Walter,	Nora Springs,	Floyd.
Baughman, A. E.,	Rockwell City,	Calhoun.
Bawn, George F.,	Eagle Grove,	Wright.
Baxter, C. M.,	Atlantic,	Cass.
Bay, H. L.,	Albia,	Monroe.
Beadle, Joseph,	Russell,	Lucas.
Beals, A. E.,	Russell,	Lucas.
Beard, Wm. E.,	Decorah,	Winneshiek.
Beavers, W. L.,	Hepburn,	Page.
Bebensee, Carl,	Council Bluffs,	Pottawattamie.
Beck, A. F.,	Kellerton,	Ringgold.
Beck, Dick C.,	Council Bluffs,	Pottawattamie.
Bedell, L. F.,	Springville,	Linn.
Bemis, Paul R.,	Ankeny,	Polk.
Beneke, R. J.,	Palmer,	Pocahontas.
Beason, Edwin B.,	Jackson,	*Minnesota.*
Berry, Don L.,	Indianola,	Warren.
Biedenfeld, Carl,	Granville,	*Illinois.*
Biewen, Chas. J.,	Ames,	Story.
Black, James S.,	Maxwell,	Story.
Blake, Dell S.,	Dallas Center,	Dallas.
Blake, W. O.,	Dallas Center,	Dallas.
Blauer, Roy,	Mt. Ayr,	Ringgold.
Boeke, John H.,	Hubbard,	Hardin.
Boerhave, George,	Sheldon,	O'Brien.
Bonewell, Chester,	Grinnell,	Poweshiek.
Boven, H. H., Jr.,	Grundy Center,	Grundy.
Boyack, Geo.,	Grinnell,	Poweshiek.
Boyd, Gaston S.,	Russell,	Lucas.
Boynton, E. W.,	Webster City,	Hamilton.
Brandow, J. LeRoy,	Algona,	Kossuth.
Brant, John E.,	Lorimor,	Union.
Brazell, Dorn,	Harpers Ferry,	Allamakee.
Breckenridge, Russell,	Clarion,	Wright.
Brewers, Orville,	Stanhope,	Hamilton.
Broadie, Fred W.,	Rutleven,	Clay.
Brown, Edward,	Van Meter,	Dallas.

Brown, Frank,	Shannon City,	Union.
Brown, Julius G.,	Solon,	Johnson.
Brown, John J.,	Valley Junction,	Polk.
Brown, J. W.,	Boone,	Boone.
Brown, Millard K.,	Eagle Grove,	Wright.
Brown, Ray,	Parkersburg,	Butler.
Brown, Raymond B.,	Inwood,	Lyon.
Brunsvold, Albert,	Jackson,	*Minnesota.*
Bunz, James,	Ankeny,	Polk.
Burford, Thos. V.,	Des Moines,	Polk.
Burkhart, Lester W.,	Zearing,	Story.
Burn, Clinton,	Kent,	Union.
Bute, Elvin,	Stanhope,	Hamilton.
Chandler, C. F.,	Kellerton,	Ringgold.
Chapman, Ralph,	Bagley,	Guthrie.
Christiansen, Clarence,	Gowrie,	Webster.
Clark, Albert,	Clarion,	Wright.
Clark, L. F.,	Des Moines,	Polk.
Clark, M. J.,	Ames,	Story.
Clark, Will H.,	Mt. Vernon,	Linn.
Cobeen, Albin,	Manly,	Worth.
Coffin, Clyde,	Pleasant Plain,	Jefferson.
Condes, Frank L.,	Packwood,	Jefferson.
Conover, H. W.,	Ames,	Story.
Conover, R. G.,	Ames,	Story.
Cooper, Fay,	Plymouth,	Cerro Gordo
Correll, Charles W.,	Austin,	*Manitoba, Can.*
Crary, Ralph,	Madrid,	Boone.
Cray, John H.,	Wellman,	Washington.
Crooks, George W.,	Boone,	Boone.
Crosby, George,	Montgomery,	Dickinson.
Crossley, George,	Council Bluffs,	Pottawattamie.
Crowley, John L.,	Hopkinton,	Linn.
Darger, H. C.,	Sioux City,	Woodbury.
Daugherty, Vincent,	Bellevue,	Jackson.
Davis, C. H.,	Hedrick,	Keokuk.
Davis, T. M.,	Union,	Hardin.
Davison, Roy,	Shambaugh,	Page.
Dehner, John D.,	Cascade,	Jones.
Delay, Joseph J.,	Monticello,	Jones.
Delay, Matt,	Monticello,	Jones.
Dentschle, Lester,	Butler,	Keokuk.
Dewees, C. B.,	Whittier,	Linn.
Dill, J. B.,	Washington,	Washington
Dillon, Emory,	Lamoni,	Decatur.
Dobson, Frank,	Ft. Madison,	Lee.
Doctor, Floyd,	Clarion,	Wright.
Dodge, Wallace K.,	Newton,	Jasper.
Doidge, William,	Perry,	Dallas.
Dustman, H. D.,	Sperry,	Des Moines.
Eckman, Roy,	Kiron,	Sac.
Elgin, Chester,	Greene,	Butler.
Elipson, E. A.,	Woolstock,	Wright.
Elliott, W. G.,	LeMars,	Plymouth.
Ellison, Edw. A.,	Lawton,	Woodbury.
Emerson, Ross F.,	Clarence,	Cedar.
Engstrand, Roy,	Galva,	Henry.
Engstrom, E. L.,	Boone,	Boone.
Engstrom, Francis,	Gowrie,	Webster.

Eno, I. L.,	Havelock,	Pocahontas.
Erwin, Frank,	Kellerton,	Ringgold.
Esch, Fred,	Mingo,	Jasper.
Everly, George W.,	Adair,	*Illinois.*
Fagen, Ivyl R.,	Perry,	Dallas.
Falke, Leslie R.,	Clarinda,	Page.
Farrell, T. B.,	Ankeny,	Polk.
Farstrup, Peter,	Exira,	Audubon.
Feazell, Geo. F.,	Bridgewater,	Adair.
Feuling, L. V.,	Ames,	Story.
Finch, R. E.,	Fredericksburg,	Chickasaw.
Fischer, Miss Ida M.,	Shenandoah,	Page.
Fletcher, W. D.,	Winterset,	Madison.
Flomers, Forest,	Corning,	Adams.
Flynn, John P.,	New Hartford,	Butler.
Fossum, Adolph H.,	Waukon,	Allamakee.
Fox, Stacey,	Council Bluffs,	Pottawattamie.
Freeman, Lonnie,	Norwalk,	Warren.
Freeman, Roy,	Fontanelle,	Adair.
French, D. W.,	Honey Creek,	Pottawattamie.
Freriche, Theo.,	Ackley,	Hardin.
Frey, F. M.,	Ames,	Story.
Fuchs, F. R.,	Laurens,	Pocahontas.
Garland, Peter J.,	Jamaica,	Guthrie.
Garrett, Chas. O.,	Mitchellville,	Polk.
Garrett, Orville,	Mitchellville,	Polk.
Garrity, J. J.,	DeWitt,	Clinton.
Gatchel, C. N.,	Ft. Dodge,	Webster.
Genrick, Albert,	Luverne,	Kossuth.
Ghrist, James,	Ames,	Story.
Gilbert, E. L.,	Algona,	Kossuth.
Gilmore, J. J.,	Imogene,	Fremont.
Gingerich, Leroy D.,	Manson,	Calhoun.
Glan, H. C. von,	Breda,	Carroll.
Glassburner, Fred,	Arion,	Crawford.
Glassel, George,	Grafton,	Worth.
Goudy, Merle,	Mt. Vernon,	Linn.
Grace, J. E.,	Oxford,	Johnson.
Gradest, Harry H.,	Bryant,	Clinton.
Grandard, Alexander,	Waukon,	Allamakee.
Grandfield, C. C.,	Lorimor,	Union.
Greenfield, J. B.,	Wheaton,	*Illinois.*
Grow, Lawrence,	Rippey,	Greene.
Guge, Ernest,	Jackson,	*Minnesota.*
Gustafson, Emery,	Lanyon,	Webster.
Gustafson, Victor E.,	Harcourt,	Webster.
Guyer, W. J.,	Des Moines,	Polk.
Haddock, G. W.,	Marshalltown,	Marshall.
Hagen, Louis,	Radcliffe,	Hardin.
Hagglund, Bernard,	Essex,	Page.
Hahn, Bruno H.,	Walcott,	Scott.
Hall, Harry,	Brooklyn,	Poweshiek.
Hall, J. Floyd,	Springville,	Linn.
Hamdorf, Chris, Jr.,	Massillon,	Cedar.
Hamdorf, Willie,	Lowdin,	Cedar.
Hamilton, John A.,	Garden Grove,	Decatur.
Hamma, A. J., Jr.,	Knoxville,	Marion.
Hammond, Arthur,	Clear Lake,	Cerro Gordo.
Hansen, Tens P.,	Aurelia,	Cherokee.

Hanson, Charles,	Alta,	Buena Vista.
Hanson, F. B.,	Inwood,	Lyon.
Hanson, Walter,	Dayton,	Webster.
Hardy, Evan A.,	Sioux City;	Woodbury.
Hariff, P. J.,	Lamoni,	Decatur.
Harrington, Timothy,	Oelwein,	Fayette.
Harron, Arthur O.,	Rockwell,	Cerro Gordo.
Hartley, W. R.,	Pomeroy,	Calhoun.
Harvey, Melville,	Ankeny,	Polk.
Hawk, O. E.,	Hedrick,	Keokuk.
Hawkins, A. B.,	Farley,	Dubuque.
Hayden, H. H.,	Selma,	Van Buren.
Hayes, R. B.,	Palo,	Linn.
Hazard, C. B.,	Marathon,	Buena Vista.
Hazen, Glenn,	Denmark,	Lee.
Heidman, Henry S.,	Granger,	Dallas.
Heard, Floyd I.,	Zearing,	Story.
Hendrickson, Henry,	Brooklyn,	Poweshiek.
Hendrickson, T. Jesse,	Brooklyn,	Poweshiek.
Herriott, A. C.,	Casey,	Guthrie.
Herriott, Kenneth,	Casey,	Guthrie.
Herron, J. K.,	Redding,	Ringgold.
Hershey, M. B.,	Norway,	Benton.
Higginbotham, H. W.,	Eldora,	Hardin.
Hill, Eric T.,	Thor,	Webster.
Hill, J. F.,	Muscatine,	Muscatine.
Hill, J. J.,	Marsh,	Louisa.
Hodgin, Henry S.,	Springville	Linn.
Hoffa, L. A.,	Grundy Center,	Grundy.
Hogerty, M. C.,	Dexter,	Guthrie.
Holkesvik, Julian A.,	Locust,	Winneshiek.
Holkesvik, Roy E.,	Locust,	Winneshiek.
Holtkamp, Ben J.,	West Point,	Lee.
Hoover, Homer,	Oskaloosa,	Mahaska.
Horning, F. J.,	Ankeny,	Polk.
Horsman, Ray,	Knoxville,	Marion.
Hoskins, Gilbert,	Pleasant Plain,	Washington.
Housel, Edward,	Mt. Pleasant,	Henry.
Hove, Erick,	Stanhope,	Hamilton.
Hovey, L. S., Jr.,	Jesup,	Buchanan.
Hoyt, Edward,	Scotch Grove,	Jones.
Hudston, L. E.,	Knoxville,	Marion.
Hug, Fritz,	Polk,	Polk.
Hulbert, J. H.,	Fontanelle,	Adair.
Humphrey, M. A.,	Logan,	Harrison.
Hunt, J. E.,	Creston,	Union.
Hunt, J. M.,	Ackley,	Hardin.
Jacobs, George,	West Bend,	Palo Alto.
Jarstad, Henry,	Stanhope,	Hamilton.
Jensen, J. E.,	Sac City,	Sac.
Jewell, Raymond,	Sheffield,	Franklin.
Jipson, Harry,	Everly,	Clay.
Johammes, William,	Ashton,	Osceola.
Johnson, Adolph,	Eagle Grove,	Wright.
Johnson, A. L.,	Iowa Falls,	Hardin.
Johnson, Floyd F.,	Madrid,	Boone.
Johnson, Johnie,	Kanawha,	Hancock.
Johnson, John R.,	Radcliffe,	Hardin.
Johnson, Martin,	Norwich,	Page.

Johnston, David D.,	Clarinda,	Page.
Johnston, Wm. G.,	Humboldt,	Humboldt.
Jones, Walter C.,	Richland	Keokuk.
Joyce, Oliver F.,	Atlantic,	Cass.
Judge, Raymond,	Boone,	Boone.
Karn, Bert,	Fairfield,	Jefferson.
Keables, R. S.,	Gilman,	Marshall.
Kelley, Selby,	Clarinda,	Page.
Kepper, Lawrence,	Winfield,	Henry.
Kepper, Sam,	Winfield,	Henry.
Kerr, Harrie,	Battle Creek,	Ida.
Ketelsen, Thos. P. C.,	Charlotte,	Clinton.
Klay, John T.,	Rock Valley,	Sioux.
Klippel, W. Y.,	Britt,	Hancock.
Knutsen, P. S.,	Badger,	Webster.
Knutson, Andrew,	Radcliffe,	Hardin.
Kooser, Galen B.,	Ames,	Story.
Kraft, J. H.,	Des Moines,	Polk.
Kruger, Edwin,	Grafton,	Worth.
Kruse, P. W.,	Gooselake,	Clinton.
Kugis, John,	Bouton,	Dallas.
Kurtz, Hubert P.,	Pleasant Plain,	Jefferson.
Kurtzweil, George L.,	Altoona,	Polk.
Lang, Allen A.,	Brooklyn,	Poweshiek.
Lang, H. Newton,	Wilford Junction,	Muscatine.
Lang, J. Russell,	Brooklyn,	Poweshiek.
Larson, Charles A.,	Dayton,	Webster.
Larston, Gerald W.,	Story City,	Story.
Lawrence, Mark K.,	Mt. Pleasant,	Henry.
Louck, G. W.,	Indianola,	Warren.
Lee, Edd,	Council Bluffs,	Pottawattamie.
Leemon, John Alexander,	Hoopeston,	*Illinois.*
Leftwich, G. S.,	Carlisle,	Warren.
Leinard, Arthur H.,	Winterset,	Madison.
Lewis, Ed,	Ankeny,	Polk.
Linman, Charles,	Pocahontas,	Pocahontas.
Linman, Virgil,	Kiron,	Crawford.
Linnastruth, Wm.,	Humboldt,	Humboldt.
Lofgren, G. S.,	Dayton,	Webster.
Long, Lloyd D.,	Lu Verne,	*Minnesota.*
Longworth, Harval A.,	Polk City,	Polk.
Lorenzen, J. F.,	Scranton,	Greene.
Lovell, Will H.,	Greene,	Butler.
Lovesee, H. S.,	Storm Lake,	Buena Vista.
Madison, George,	Goldfield,	Wright.
Mann, Clyde,	Sutherland,	O'Brien.
Markle, Frank,	Lawler,	Chickasaw.
Marsh, H. L.,	Dexter,	Dallas.
Martfeld, Arthur S.,	Eagle Grove,	Wright.
Martin, Mervin,	Hancock,	Pottawattamie.
Marts, Arthur C.,	Polk,	Polk.
Mason, Claud,	Iowa Falls,	Hardin.
Maudsley, J. C.,	Burt,	Kossuth.
Maxwell, J. M.,	Crawfordsville,	Washington.
Meinke, Wm. T.,	Maquoketa,	Jackson.
Melchen, Wm. F.,	Ashton,	Osceola.
Merritt, Archie G.,	Kellerton,	Ringgold.
Messer, R. J.,	Hedrick,	Keokuk.
Messer, Roy E.,	Zearing,	Story.

Meswarb, Aug.,	Sumner,	Bremer.
Middleton, J. C.,	Eagle Grove,	Wright.
Miller, John,	Clarence,	Cedar.
Millhone, Frank,	Clarinda,	Page.
Mills, W. S.,	Creston,	Union.
Mitchell, Alexander L.,	Northwood,	Worth.
Moine, Fred,	Republic,	Chickasaw.
Moine, L. E.,	Republic,	Chickasaw.
Monnich, Maurice J.,	Hooper,	*Nebraska.*
Monohan, J. J.,	Charlotte,	Clinton.
Monohan, Tom,	Dunlop,	Harrison.
Morgan, Frank,	Red Oak,	Montgomery.
Mosher, Mrs. M. L.,	West Branch,	Cedar.
Moss, G. F.,	Madrid,	Boone.
Mowery, H. D.,	Hedrick,	Keokuk.
Mullin, W.,	Winfield,	Henry.
Murphy, Edward J.,	Iowa City	Johnson.
McLaughlin, Charles E.,	Cumming,	Warren.
McLaughlin, C. L.,	Marathon,	Buena Vista.
McLaughlin, Frank,	Coon Rapids,	Carroll.
McCannon, Guy,	Numa,	Appanoose.
McClellan, C. L.,	Lowden,	Cedar.
McClusky, Walter,	Anthon,	Woodbury.
McConnell, Frank,	Webster City,	Hamilton.
McDermott, V. J.,	Ames,	Story.
McDonald, W. P.,	Ames,	Story.
McKay, Albert M.,	Ida Grove,	Ida.
McKee, A. D.,	Rock Rapids,	Lyon.
McKee, Ryle S.,	Indianola,	Warren.
McMahon, Hugh,	Tara,	Webster.
Nash, Hugh B.,	Denison,	Crawford.
Neal, Ernest N.,	Shell Rock,	Butler.
Nelson, Elmer,	Stanhope,	Hamilton.
Neppel, James,	Carroll,	Carroll.
Neppel, Max,	Carroll,	Carroll.
Neslund, Clarence,	Slater,	Boone.
Neumerfer, Charles,	Breda,	Carroll.
O'Connor, B. S.,	Honey Creek,	Pottawattamie.
Ohlson, Lloyd,	Cherokee,	Cherokee.
Oleson, Loyd,	Eagle Grove,	Wright.
Olsan, Milos,	Ames,	Story.
Olson, Cornelius,	Waterville,	Allamakee.
Olson, Ingval,	Waterville,	Allamakee.
Olson, Louis T.,	Ames,	Story.
Olvak, James,	Creston,	Union.
Overland, Jasper,	Jewell,	Hamilton.
Oxley, Fred E.,	Corwith,	Hancock.
Page, Frank H.,	Des Moines,	Polk.
Paine, Morris,	Eagle Grove,	Wright.
Pantenburg, P. J.,	Ames,	Story.
Pascoe, Vernie,	Chapin,	Franklin.
Patridge, Irving,	Maynard,	Fayette.
Patterson, B. E.,	Stratford,	Boone.
Patton, Jas. V.,	Albia,	Monroe.
Pellett, Clarence A.,	Atlantic,	Cass.
Peters, A. C.,	West Side,	Crawford.
Peterson, Albert,	Kiron,	Sac.
Peterson, Carl A.,	Cherokee,	Cherokee.
Peterson, Ernest,	Cherokee,	Cherokee.

Phillips, G. S.,	New Sharon,	Mahaska.
Pierce, W. F.,	Ionia,	Chickasaw.
Pitstick, Chas.,	Yetter,	Calhoun.
Plambeck, Hugo J.,	Davenport,	Scott.
Platt, B. D.,	Cedar Falls,	Blackhawk.
Poitevin, Edwin,	Dow City,	Crawford.
Porter, C. E.,	Olin,	Jones.
Porter, Fred L.,	Stanwood,	Cedar.
Pothast, Ed. A.,	Waverly,	Bremer.
Prall, L. E.,	Ames,	Iowa.
Presternon, Alvin,	Waukon,	Allamakee.
Quigg, Claude E.,	Lynnville,	Jasper.
Quillhart, Vernon J. F.,	Ankeny,	Polk.
Rabe, E. C.,	Alta Vista,	Chickasaw.
Raimer, Frank,	Logan,	Harrison.
Randolph, Ellis,	Ankeny,	Polk.
Ray, J. I.,	Fremont,	*Nebraska.*
Read, Roy,	Brooklyn,	Poweshiek.
Rees, Wm. D.,	Emerson,	Mills.
Reeve, H. D., Jr.,	Des Moines,	Polk.
Reeves, Raie W.,	Berwick,	Polk.
Reiter, Christ.,	Monticello,	Jones.
Renander, J. A.,	Essex,	Page.
Renners, Terry,	Coon Rapids,	Carroll.
Rice, B. B.,	Grand Island,	*Nebraska.*
Rice, C. D.,	Ames,	Story.
Riddle, Clinton,	Chapin,	Franklin.
Ridge, Roy R.,	Rockwell City,	Calhoun.
Riggs, Lee S.,	Muscatine,	Muscatine.
Rinshaw, S. R.,	North Liberty,	Johnson.
Roberts, Clark L.,	Veo,	Jefferson.
Roberts, Guy L.,	Monroe,	Jasper.
Roberts, William,	Council Bluffs,	Pottawattamie.
Rockafellow, Ray,	West Liberty,	Muscatine.
Rockwell, A. R.,	Paullina,	O'Brien.
Rogers, T. W.,	Humboldt,	Humboldt.
Rose, S. C.,	Stratford,	Hamilton.
Rosenfeld, Carl A.,	Kelley,	Story.
Rost, Fred,	Moscow,	Muscatine.
Rowley, Elmer,	Livermore,	Humboldt.
Ruprecht, Paul,	Massillon,	Cedar.
Safley, M. G.,	Bedford,	Taylor.
Sandhorn, Harry,	Dayton,	Webster.
Sarchett, Roy,	Burt,	Kossuth.
Sawhill, Edwin,	Clarinda,	Page.
Sawin, H. W.,	Northwood,	Worth.
Scamman. W. C.,	Tarkio,	Missouri.
Schaeffer, L. L.,	Eagle Grove,	Wright.
Scherer, Arthur J.,	Afton,	Union.
Schmidt, H. H.,	Parkersburg,	Butler.
Schmittjer, D. J.,	Delhi,	Delaware.
Schmittjer, Wm.,	Delhi,	Delaware.
Schneider, August,	Lowden,	Cedar.
Seidl, J. B.,	Dedham,	Carroll.
Selnes, M. A.,	Spring Grove,	Minnesota.
Severson, Harry,	Cambridge,	Story.
Severson, J. M.,	Rolfe,	Pocahontas.
Sharp, Irwin S.,	McClelland,	Pottawattamie.
Shawver, C. A.,	Pleasantville,	Marion.

Sheehan, Bernard,	Osage,	Mitchell.
Shepard, George,	Gilbert Station,	Story.
Shetterly, Roy A.,	Lorimor,	Union.
Shivvers, L. C.,	Knoxville,	Marion.
Shivvers, R. W.,	Knoxville,	Marion.
Shoemaker, L. L.,	Corning,	Adams.
Smalley, D. G.,	Blockton,	Taylor.
Smith, Ryman J.,	Van Meter,	Dallas.
Smith, R. W.,	Washburn,	Wisconsin.
Smith, Walter E.,	Washington,	Washington.
Smoley, R. G.,	Keystone,	Benton.
Snater, Rieko,	Ackley,	Franklin.
Snyder, Cliff J.,	Pierson,	Woodbury.
Sogn, Oscar,	Inwood,	Lyon.
Soseman, Floyd,	Oskaloosa,	Mahaska.
Spauldin, Thornton J.,	Dawson,	Dallas.
Speers, Charles H.,	Bagley,	Greene.
Stafford, A. E.,	Foster,	Monroe.
Standiford, B. E.,	Tarkio,	Missouri.
Stephan, Henry,	Early,	Sac.
Sterling, Paul,	Webster City,	Hamilton.
Stevens, F. A.,	Boone,	Boone.
Stevens, Frank B.,	Genesco,	Henry.
Stewart, Tom,	Ainsworth,	Washington.
Strong, Emery,	Clarinda,	Page.
Sunderland, Roy,	Harlan,	Shelby.
Swank, Edwin L.,	Mt. Vernon,	Linn.
Swanson, George,	Pomeroy,	Calhoun.
Tarr, H. Don,	Woodward,	Dallas.
Taylor, Graydon,	Madrid,	Polk.
Telleen, Carl J.,	Gowrie,	Webster.
Thatcher, J. L.,	Davenport,	Scott.
Thomas, L. E.,	Hazelton,	Buchanan.
Thomas, Merton,	Dow City,	Crawford.
Thomas, Lonnie,	Clarinda,	Page.
Thomason, Park,	Lacona,	Warren.
Thompson, Clarence,	Ute,	Monona.
Thompson, Sherman,	Ankeny	Polk.
Thomson, Ed,	Stanwood,	Cedar.
Thorsrud, Clarence,	Callender,	Webster.
Thorsrud, Martin,	Callender,	Webster.
Tink, Eugean,	Deloit,	Crawford.
Tostenson, L. O.,	Nicollet,	Minnesota.
Tracy, Guy C.,	Nashua,	Chickasaw.
Treie, Ben,	Ogden,	Boone.
Tvedt, Clarence,	Hubbard,	Hardin.
Twedt, Emil,	Story City,	Story.
Twedt, J. O.,	Roland,	Story.
Ure, R. E.,	New Hampton,	Chickasaw.
Utley, Donald,	New Hampton,	Chickasaw.
Valland, Ole,	Radcliffe,	Hardin.
Walker, Clyde H.,	Clarinda,	Page.
Wasson, Edith R.,	Des Moines,	Polk.
Welty, Donald C.,	Ames	Story.
Werner, Orval,	Perry,	Dallas.
Werner, Samuel,	Brooklyn,	Poweshiek.
Westley, Roy O.,	Panora,	Guthrie.
Wheelan, John H.,	Washington,	Washington.
Whildin, Ira,	Big Rock,	Illinois.

White, Leonard D.,		Afton,	Union.
White, S. K., Jr.,		Ames,	Story.
Whiting, Howard N.,		Des Moines,	Polk.
Whitson, Daniel B.,		McClelland,	Pottawattamie.
Widen, Ed.,		Harcourt,	Webster.
Wilcox, Fred,		Grimes,	Polk.
Wild, Fred,		Springville,	Linn.
Wilike, C. H.,		Preston,	Jackson.
Willer, Arthur,		Moville,	Woodbury.
Williams, Arthur,		Ottumwa,	Wapello.
Williams, Willie,		Garfield,	Illinois.
Wilson, Harold,		Prairie City,	Jasper.
Winkeman, A. D.,		Churdan,	Greene.
Winkelman, C. B.,		Churdan,	Greene.
Wold, Hehner,		Waukon,	Allamakee.
Wood, Verne C.,		Fonda,	Pocahontas.
Wood, W. S.,		Iowa Falls,	Hardin.
Wooley, Richard B.,		Adelphi,	Polk.
Wright, George C.,		Lake City,	Calhoun.
Wright, Robert A.,		Carroll,	Carroll.
Wylie, Harry E.,		Madrid,	Polk.
Wylie, Paul E.,		Des Moines,	Polk.
Yarde, Walton,		Sutherland,	O'Brien.

ENROLLMENT FOR SHORT COURSE IN BUTTER MAKING.

NAME	COURSE	TOWN	COUNTY
Ankerstjerne, M.,		Portsmouth,	Shelby.
Bintz, A. H.,		Hazelton,	Buchanan.
Bruger, J. C.,		Van Horn,	Benton.
Capper, O. C.,		Westgate,	Fayette.
Chapman, W. H.,		Wayne,	*Nebraska.*
Cramore, Ed.,		Camp Point,	Illinois.
Floden, T. L.,		————,	————
Gorkinger, P.,		Dyersville,	Dubuque.
Graf, N. W.,		Elma,	Howard.
Hansen, Nels,		Stuart,	Adair.
Hansen, C. O.,		Archer,	*Nebraska.*
Hanson, Nis E.,		Kirkman,	Shelby.
Jeffries, G. C.,		Mitchellville,	Polk.
Jensen, Jens,		Newburg,	Jasper.
Jensen, O. Q.,		Waterville,	Allamakee.
Johnson, John,		Burr Oak,	Winnebago.
Johnson, R. D.,		Alden,	Hardin.
Kramer, N. J.,		Ashton,	Osceola.
Langford, J. B.,		Shabbona,	Illinois.
Larsen, Lawrence H.,		Goldfield,	Wright.
Leach, Mrs. Oliver H.,		Denver,	Colorado.
Meyer, Theo.,		Royal,	Clay.
Monson, Peter,		Humboldt,	Humboldt.
McKenday, J. A.,		Archer,	*Nebraska.*
Roch, F. J.,		Chippewa Falls,	Wisconsin.
Schurke, W. F.,		New Hampton,	Chickasaw.
Shaunce, G. T.,		State Center,	Marshall.
Skitt, W. H.,		Adair,	Adair.
Stephenson, F. W.,		Lamont,	Buchanan.
Thieleke, Aug.,		Sherman,	Texas.

Werner, George T.,	Welcome,	Minnesota.
Woodworth, Charles L.,	New Hampton,	Chickasaw.

ENROLLMENT FOR SHORT COURSE IN FARM DAIRYING.

NAME	TOWN	COUNTY
Anderson, Hans,	Audubon,	Audubon.
Barnes, L. C.,	Alpha,	Fayette.
Batchelder, Guy,	Martelle,	Jones.
Bulkeley, F. L.,	Greene,	Butler.
Clausen, Fritz M.,	Goldfield,	Wright.
Colton, Milton,	Manchester,	Delaware.
Crocker, H. M.,	Clarksville,	Butler.
Esse, Arnold H.,	Manchester,	Delaware.
Ferguson, L. E.,	Laurens,	Pocahontas.
Gregor, F. L.,	Ft. Dodge,	Webster.
Gude, George,	Hamlin,	Audubon.
Guthrie, G. H.,	Ames,	Story.
Hillman, Fred,	Lytton,	Sac.
Holmes, Frank,	Newman Grove,	*Nebraska.*
Holmes, F. E.,	Orvillo,	*Ohio.*
Kohler, August,	Preston,	Jackson.
Kjora, H. H.,	St. Olaf,	Clayton.
Lang, Mrs. Anna R.,	Davenport,	Scott.
Livermann, J. H.,	Alton,	Sioux.
Lohr, Paul,	Manchester,	Delaware.
Madison, Marquis,	Goldfield,	Humboldt.
Miller, G. M.,	Osterdock,	Clayton.
Miller, Wylie W.,	Osterdock,	Clayton.
Nielsen, Niels J.,	Goldfield,	Wright.
Nielson, Niels,	Cedar Falls,	Blackhawk.
Oddy, Joe,	Casey,	Guthrie.
Olson, Charlie,	Goldfield,	Humboldt.
Olson, Chris,	Linn Grove.	Buena Vista.
Omvig, Tom C.,	Webster City,	Hamilton.
Peterson, Peter,	Hawarden,	Sioux.
Rasmus, Irwin V.,	Garner,	Hancock.
Rasmussen, Christian,	Garner,	Hancock
Ryan, James,	Ryan,	Delaware.
Schroedermirer, Howard E.,	Waverly,	Bremer.
Seely, Frank,	Maynard,	Fayette.
Stewart, Hugh,	Des Moines,	Polk.
Storbeck, A. C.,	Elkader,	Clayton.
Teague, Ray G.,	Oelwein,	Fayette.
Thomsen, A.,	Omaha,	*Nebraska.*
Thomsen, Carl,	Fremont,	*Nebraska.*
Turner, J. E.,	Anita,	Cass.
Watson, James,	Ames,	Story.
Wimer, Harry,	Blencoe,	Monona.
Zimmerman, A. C.,	Columbus,	*Nebraska.*

ENROLLMENT FOR SHORT COURSE IN DOMESTIC ECONOMY.

NAME	TOWN	COUNTY
Allen, Miss Christine,	Keota,	Washington
Anderson, Isabel,	Bondurant,	Polk.
Arnold, Amanda E.,	Klemme,	Hancock.

Beck, Mrs. A. F.,	Kellerton,	Ringgold.
Bishop, Hazel,	State Center,	Marshall.
Boyd, Mrs. O. S.,	Roland,	Story.
Buckton, Lura,	Ames,	Story.
Carpenter, Beth,	State Center,	Marshall.
Cornwell, Jennie M.,	Ankeny,	Polk.
Cornwell, Pearl,	Ankeny,	Polk.
Crossley, Belle,	Council Bluffs,	Pottawattamie.
Doolittle, Winifred,	Ames,	Story.
Eckman, Hazel,	Kiron,	Sac.
Edenson, Selma,	Ames,	Story.
Erickson, Miss Lydia,	Lanyon,	Webster.
Erickson, Victoria,	Odebolt,	Sac.
Evans, Mrs. George W.,	Ottumwa,	Wapello.
Garrett, Florence,	Mitchellville,	Polk.
Gatewood, Ethel,	Ames,	Story.
Gilchrist, Margaret,	Ames,	Story.
Harvey, Mrs. Effa,	Ames,	Story.
Hayne, Alda,	State Center,	Marshall.
Hendrickson, Miss Ellen,	Brooklyn,	Poweshiek.
Hurdle, Dollie,	Clarinda,	Page.
Kelley, Zora,	Clarinda,	Page.
Kintley, Mary,	Ames,	Story.
Larson, Mabel,	Odebolt,	Sac.
Layman, Mrs. Susie B.,	Ames,	Story.
Lisle, Ina,	Jamaica,	Guthrie.
Lorenzen, Elena,	Scranton,	Greene.
Martfeld, Ella,	Eagle Grove,	Wright.
Middleton, Bessie,	Eagle Grove,	Wright.
Myers, Grace,	Shell Rock,	Butler.
Myers, Hazel,	Shell Rock,	Butler.
McCarty, Goldie,	Jamaica,	Guthrie.
Niswender, Amanda,	Ames,	Story.
Pflieger, Alma H.,	Ames,	Story
Pflieger, Margaret,	Dunlap,	Harrison.
Randolph, Jane,	Ankeny,	Polk.
Riedesel, Miss Elsie,	Glidden,	Carroll.
Robinson, Erma,	State Center,	Marshall.
Schmidt, Marie,	Ames,	Story.
Shain, Miss Clara,	Jefferson,	Greene.
Snyder, Miss Nannie,	Jefferson,	Greene.
Taff, Henrietta,	Panora,	Guthrie.
Thurber, Mildred,	Des Moines,	Polk.
Wentworth, Helen,	State Center,	Marshall.
Wentworth, Marian,	State Center,	Marshall.
Wessel, Edna,	Bondurant,	Polk.
Westrom, Mabel,	Lake View,	Sac.
Williams, Hazel O.,	Paton,	Greene.

Total, 627

SUMMARY OF STUDENTS, IOWA STATE COLLEGE, 1909-1910.

1—The Division of Agriculture.

Graduate Students:

Agronomy	4	
Animal Husbandry	6	
Horticulture and Forestry	2	12

Senior Class:			
Agronomy	5		
Dairying	6		
Animal Husbandry	36		
Horticulture and Forestry	1		
Agricultural Engineering	2	50	
Junior Class:			
Agronomy	21		
Dairying	10		
Animal Husbandry	32		
Horticulture and Forestry	10		
Science and Agriculture	1	74	
Sophomore Class:			
Agronomy	32		
Dairying	8		
Animal Husbandry	59		
Horticulture and Forestry	14		
Agricultural Engineering	2	115	
Freshman Class:			
Agronomy	43		
Dairying	19		
Animal Husbandry	94		
Horticulture and Forestry	18		
Agricultural Engineering	8	182	
Academic Class:			
Agronomy	21		
Dairying	9		
Animal Husbandry	46		
Horticulture	9		
Agricultural Engineering	1	86	
Specials:			
Agronomy	2		
Animal Husbandry	6	8	
Unclassified:			
Agronomy	1		
Dairying	33		
Animal Husbandry	24		
Horticulture and Forestry	1		
Agricultural Engineering	3	62	
Winter Short Course:			
Agronomy and Animal Husbandry	470		
Creamerymen	54		
Farm Dairying	22		
Poultry	12		
Horticulture	18	576	1165

2—Veterinary Division.

Senior Class	18
Junior Class	28
Sophomore Class	32

Freshman Class	37	115	115
3—Engineering Division.			
Senior Class:			
Mechanical Engineering	22		
Civil Engineering	52		
Electrical Engineering	22		
Mining Engineering	7		
Ceramics	1	104	
Junior Class:			
Mechanical Engineering	34		
Civil Engineering	54		
Electrical Engineering	39		
Mining Engineering	4		
Ceramics	1	132	
Sophomore Class:			
Mechanical Engineering	32		
Civil Engineering	49		
Electrical Engineering	50		
Mining Engineering	19		
Ceramics	4	154	
Freshman Class:			
Mechanical Engineering	42		
Civil Engineering	66		
Electrical Engineering	65		
Mining Engineering	10		
Ceramics	1	184	
Academic Class:			
Mechanical Engineering	23		
Civil Engineering	35		
Electrical Engineering	30		
Mining Engineering	4		
Ceramics	1	93	
Specials:			
Mechanical Engineering	1		
Civil Engineering	4	5	
Unclassified:			
Mechanical Engineering	5		
Civil Engineering	1		
Electrical Engineering	1	7	679
4—Science Division.			
Graduate Students:			
Science	8	8	
Senior Class:			
Science	23		
Domestic Economy	13	36	
Junior Class:			
Science	15		
Domestic Economy	9	24	

Sophomore Class:			
Science	17		
Domestic Economy	40	57	
Freshman Class:			
Science	27		
Domestic Economy	54	81	
Academic Class:			
Science	21		
Domestic Economy	19	40	
Specials:			
Science	1	1	
Unclassified:			
Science	1		
Domestic Economy	5	6	
Winter Short Course:			
Domestic Economy	51	51	304
5—Music Division.			
College Music Students	14		
Unclassified	119	133	133
Total			2,396
Less names counted twice			46
			2,350

SUMMARY OF GRADUATES.

		1909
Number of first degrees granted 1872-1909	2221	226
Present Courses		
Animal Husbandry Course, 1904-1909	122	27
Agronomy Course, 1905-1909	51	18
Horticulture and Forestry Course, 1904-1909	24	6
Dairying Course, 1904-1909	25	5
Science and Agricutural Course, 1909	1	0
Veterinary, 1880-1909	182	15
Mechanical Engineering Course, 1872-1909	210	25
Civil Engineering Course, 1872-1909	352	56
Electrical Engineering Course, 1892-1909	262	36
Mining Engineering Course, 1897-1909	29	9
Science Course, as related to the Industries, 1875-1909	430	25
Domestic Economy Course, 1907-1909	10	4
Courses Discontinued.		
Agricultural Course, leading to Degree B. S., 1872-1880	102	
Agricultural Course, leading to Degree B. S. A., 1883-1888 and 1899-1904	86	
Science and Agriculture Course, leading to Degree B. S., 1889-1890	45	
General Science Course for Ladies, 1872-1880 and 1904	48	

General and Domestic Science Course, leading to Degree of B. L., 1887-1899	93	
General and Domestic Science Course, leading to Degree of B. Ph., 1899-1900	21	
General and Domestic Science Course, leading to Degree of B. S., 1901-1908	78	
Agronomy Course, leading to Degree B. Ag., 1891-1898	50	
	2221	226
		1909
Higher Degrees, 1872-1909	133	13
Master of Scientific Agriculture	42	4
Master of Science	34	0
Other Masters' Degrees	11	
Engineers	30	6
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